

# INSECTS OF MICRONESIA

## Diptera: Ceratopogonidae<sup>1</sup>

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### INTRODUCTION

Although a number of Micronesian species of Ceratopogonidae have been reviewed during 1936 through 1941 from Professor T. Esaki's Micronesian collection, his expeditions were confined to several of the Caroline Islands and a few other islands. It was therefore with great pleasure that we undertook, at the request of W. W. Wirth and J. L. Gressitt, the examination of the massive collection of these insects, about 6,000 specimens from Micronesia, and found a richer fauna of the Ceratopogonidae than expected, discovering many species new to science.

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We wish to express our appreciation to Dr. J. L. Gressitt, who supported this study by making available the extensive collection of the Ceratopogonidae (Heleidae, "heleids") and by arranging financial assistance for illustrations. Special mention should be made of the kindness of Dr. W. W. Wirth and Professor T. Esaki who recommended us for this interesting work. Dr. D. Elmo Hardy very kindly sent the paratypes of Johannsen's *Atrichopogon varus* for this study. Thanks are also extended to Mr. M. Sasakawa for his cooperation. We express our thanks to the following collectors: Doctors and Messieurs P. A. Adams, J. W. Beardsley, R. M. Bohart, C. F. Clagg, J. F. Gates Clarke, B. McDaniel, H. S. Dybas, F. R. Fosberg, R. J. Goss, J. L. Gressitt, K. S. Hagen, Noel L. H. Krauss, Edward T. Moul, R. W. L. Potts, Ira La Rivers,

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<sup>1</sup> Representing, in part, Results of Professor T. Esaki's Micronesian Expeditions (1936-1940), No. 100.

<sup>2</sup> Editors' note. After the completion of the main part of this paper, additional specimens collected by Drs. Sabrosky and Snyder were made available. As Mrs. Murachi (formerly Miss Etsuko Komyo) had left the Entomological Laboratory, Dr. Tokunaga studied the material alone. The later data have been incorporated into the text and thus some of the new species are credited with Tokunaga's authorship only.

distal three or four modified flagellar segments to that of remaining eight or nine flagellar segments and pedicel taken together in male. Measured under  $600\times$  magnification.

h. *Maxillary palp*: Usually five-segmented, but in *Dasyhelea* species segment 1 often membranized and somewhat fused with palpifer, appearing four-segmented. Length of these segments measured with same magnification as antenna. Segment 3 with several to many hyaline spoon-like sensillae. These sensillae grouped in one, or rarely two or three, common sensory pores or scattered on a confined area. Position and shape of common sensory organs and area of scattered sensillae often offer important specific character. Moreover, segment 3 often or sometimes shows characteristic shape found in *Forcipomyia* species.

4. *Thorax*: General coloration and degree of pruinosity already discussed.

a. *Scutum*: Subdivided into paired lateral parts and median part by a pair of longitudinal pseudosutural foveae which arise from humeral pits and end at laterocephalic points of scutellum. Median part subdivided into anterior swollen area and posterior depressed caudoscuteal area; anterior area sometimes with darker or brownish marking or vitta which is sometimes subdivided longitudinally by mid-dorsal line and sometimes extended onto caudoscuteal area to varying extent. Caudoscuteal area often with a pair of large oblong paler markings along foveae. Lateral part incompletely subdivided by humeral suture anteriorly and by lateral suture at middle; of the three areas subconfined by these sutures, anterior humeral area usually somewhat paler than other parts, middle area sometimes with short, colored vitta, and caudal area usually paler; lateral part sometimes with darker or brownish longitudinal vitta along fovea and this vitta sometimes fused with median vitta. Scutum usually with a pair of humeral pits at cephalic ends of humeral sutures; these pits show trace of pupal respiratory horns and their depth and size is often used as a generic character.

b. *Scutellum*: Often showing different color from scutum and usually paler, or rarely with small markings at middle. Chaetotaxy of scutellum representing one of most important specific characters, even in highly setigerous *Forcipomyia* species.

5. *Legs*: Investigated on form of femora, tibiae, hind basitarsi, and penultimate and ultimate tarsal segments; number of femoral spines and tibial and tarsal spurs; presence or absence of ventral spines of ultimate tarsal segment; development of scales; shape and development of claws and empodium; measurement of segment lengths; calculation of tarsal ratio.

a. *Segment lengths*: Of the nine segments of legs, distal seven (femur, tibia, and five tarsal segments), measured under  $600\times$  magnification. Length of each segment does not show entire length of segment, but the length of externally visible part.

b. *TR*: Representing tarsal ratio of length of tarsal segment 1 (basitarsus) to that of tarsal segment 2.

6. *Wing venation*: The system of Tillyard (1926) as in Tokunaga (1937), Lee (1947), and Wirth (1952) was used. Nomenclature of wing veins as follows:

*Costa* (C): Strong simple vein, usually with many setae and rarely with scales, ending more or less before wing tip.

*Subcosta* (Sc): Subtrophied slender simple vein, usually absent; if present, ending in costa slightly before tip of  $R_1$ .

*Radius* (R): Strong vein, usually with setae and almost straight.

*Radius 1* ( $R_1$ ): Rather strong vein, extending in the direction of R ending in C with slightly upcurved apical part.

*Radial sector* (Rs): Branched downward obliquely, then curved distally at origin of r-m cross vein, extending almost parallel with  $R_1$  and forked into  $R_{2+3}$  and  $R_{4+5}$ . In *Bezzia* Rs simple and not forked. Generally Rs subdivided into first basal and second apical section by origin of r-m. When Rs is bifurcated, posterior branch  $R_{4+5}$  almost always extends in same direction as Rs, except for distal end. In this paper, therefore, Rs serves to show the combined length of Rs and  $R_{4+5}$ . In the majority of *Dasyhelea*, however,  $R_1$  and Rs fuse with each other forming a single vein, which is named as stem of second radial cell, and it is assumed that Rs arises from origin of r-m and ends at distal tip of  $R_{4+5}$ .

*Radius 2 and 3* ( $R_{2+3}$ ): Branched upward from  $R_s$ , usually very short, resembling cross vein between  $R_1$  and  $R_s$  and ending in  $R_1$ .

*Radius 4 and 5* ( $R_{4+5}$ ): Extending toward wing tip in same direction as  $R_s$  and ending at or slightly before tip of C, usually with more or less upcurved distal part.

*Media* (M): Arises from caudal part of arculus, extending obliquely upward, slightly curved downward at base, and then slightly divergent from R and almost straight, ending at end of r-m cross vein. In wings of certain *Bezzia*, *Palpomyia*, and *Clinohoelea* species, r-m cross vein ends a little beyond forking point of  $M_{1+2}$  ( $fM_{1+2}$ ) in  $M_1$ , therefore M is conveniently assumed to end at  $fM_{1+2}$ . From the morphological point of view, the vein M is dichotomously forked, then the distal part of M in these cases should be  $M_{1+2}$ , although the basal part of  $M_{3+4}$  is completely atrophied, especially in the case of sessile  $M_{1+2}$ .

*Media 1 and 2* ( $M_{1+2}$ ): Conveniently applied to petiolar vein before  $fM_{1+2}$  and beyond end of r-m.  $M_{1+2}$  usually very short and at most as long as r-m, if present; very often absent.

*Media 1* ( $M_1$ ): Usually almost straight and ending near wing tip. When r-m ends in  $M_1$ , this vein subdivided into very short first and a long second section.

*Media 2* ( $M_2$ ): Usually very slightly undulate, often basal part obscure or atrophied, and ending more or less behind wing tip.

*Media 3 and 4* ( $M_{3+4}$ ): Basal section completely atrophied and represented only by distal section, which appears to be a branch of  $Cu_1$ , and ending in distal half of anal margin.

*Cubitus 1* ( $Cu_1$ ): Rather long, arising from basal part of arculus, slightly divergent from M, almost straight and deflected at forking point ( $fMCu$ ) between  $M_{3+4}$  and distal section of  $Cu_1$  and ending near middle of anal margin. Thus  $Cu_1$  subdivided into first basal and second distal section, the former section expressed as stem of  $fMCu$  and the latter section simply as  $Cu_1$ .

*Cubitus 2* ( $Cu_2$ ): Simple, slender, located under  $Cu_1$ , and atrophied before anal margin.

*Anal vein* (An or lAn): Simple, somewhat thicker than  $Cu_2$ , extending along underside of  $Cu_2$  and usually atrophied near  $fMCu$ . In certain genera An bent upward near middle and a curved fold arising from bend, so that vein appears to be forked.

*Humeral cross vein* (h): Located near arculus between C and Sc.

*Radiomedian cross vein* (r-m): Situated between basal part of  $R_s$  and apical end of M (basal end of  $M_{1+2}$ ) or  $fM_{1+2}$  or basal part of  $M_1$ .

*Costal cell*: Cell above R and  $R_1$  and below costal vein. This is a compound cell (costa and subcosta united into one), vein Sc being atrophied.

*Basal radial cell*: Cell between R and M and demarcated from cell  $R_s$  by r-m cross vein.

*Distal radial cell*: When  $R_s$  is not forked ( $R_{2+3}$  absent), cell between  $R_1$  and  $R_s$  long and sometimes expressed simply as radial cell. If  $R_{2+3}$  is present, this cell subdivided into first and second radial cell by it.

*First radial cell*: Cell between  $R_1$  and  $R_s$  and demarcated distally by  $R_{2+3}$ . Often absent in *Dasyhelea* and *Forcipomyia*, owing to fusion of R and  $R_s$  and also often very narrow and slit-like.

*Second radial cell*: Cell confined by  $R_1$ ,  $R_{4+5}$ , and distal part of C. Shape of this cell often characteristic for genera or species.

7. *Wings*: Investigated on color by reflected and transmitted light; size and shape; development of anal lobe; development and reduction of macrotrichia and microtrichia; development of scales; nature of markings; presence or absence of fringe of squama and alula.

a. *Length and width*: Length measured from incision between squama and alula to tip. Width measured at broadest part in perpendicular position to longitudinal axis.

b. *Length of veins*: Proportional length of costa to wing length, relative lengths of R,  $R_1$ ,  $R_s$  ( $R_s$  and  $R_{4+5}$  taken together), and stem of  $fMCu$ , and those of r-m,  $M_{1+2}$ , and basal first sections of  $R_s$  and  $M_1$  often useful in determination of species. Costa measured from opposite point of apex of incision between squama and alula against longitudinal axis of wing to extreme tip of costa under  $150\times$  magnification (50 units = 0.65 mm.). R

measured from joint-point between arculus and R to center of forking part between  $R_1$  and  $R_s$ , and if  $R_1$  and  $R_s$  are fused, to apex of distal angle of basal radial cell between R and r-m.  $R_1$  and  $R_s$  ( $R_s$  and  $R_{4+5}$  taken together) measured from center of forking part between  $R_1$  and  $R_s$  and to extreme distal ends of  $R_1$  and  $R_s$  or  $R_{4+5}$ , respectively. Stem of fMCu measured from its origin (from arculus) to center of fMCu. Other short veins also measured from assumed centers to centers of two jointed parts. These lengths measured under  $150\times$  magnification and in very short veins,  $600\times$ .

c. *Length of wing cells*: Two radial cells measured from assumed center of forking part between  $R_1$  and  $R_s$  to center of  $R_{2+3}$  and from the latter to assumed center of jointed part of  $R_s$  and  $R_{4+5}$  and C, under  $150\times$  or  $600\times$  magnification.

d. *Position of tips of main longitudinal veins fM<sub>1+2</sub>, fMCu, and others*: Relative positions of these points shown by assumed perpendicular lines to longitudinal axis of wing.

8. *Abdomen*: Except for genital structures, tergites sometimes showing specific sculpture on cuticle and sternites showing characteristic reduction into paired discs or hemisternites. Moreover, in *Palpomyia* and *Bezzia* often paired eversible glands opened on anterior margins of certain tergites and these openings marked internally by paired slender internal rods or apodemes extending from bases of tergites toward base of abdomen in various lengths. Most important specific and generic differences found in structure of male hypopygia and female genital organs.

a. *Male hypopygium*: Simple nematoceros type, rotated on segments 8 and 9, varying but essentially consisting of tergite 9, sternite 9, paired coxites and their styles, aedeagus, and paired parameres. Tergite 9 usually expanded plate, rather convex externally, lined with a membrane, and the anus flanked by a pair of membranous and rather setose cerci on ventral side and a pair of chitinized processes or anal points on caudolateral margin. Shape of tergite 9 and form and development of anal points used as good specific characters. Sternite 9 usually much shorter, transverse, and connected by a membranous area with aedeagus. Shape of sternite 9, development of caudal median projection or shape of caudal median incision, and arrangement of setae often characteristic of species or genera. Coxites and styles most prominent appendages of male hypopygium. Coxites usually rather large, simple, conical, tapered distally, and provided with styles at distal end. In *Culicoides* and *Stilobezzia*, coxites with fairly well developed basal roots. Length measured from articulation with sternite to distal tip and width showing the broadest width which is perpendicular to longitudinal axis. Styles more important for identification of species, because development is highly specific. Relative length of style to coxite measured under  $600\times$  magnification in ventral aspect. Aedeagus located at center of ventral aspect of hypopygium, usually more or less conical or Y-shape, but variously modified in different species and also one of the most important subjects for specific identification. Parameres between aedeagus and tergite 9, consisting of a pair of submedian sclerites, but often fused in different degrees or greatly modified, showing good specific or generic characters.

b. *Female genitalia*: Mainly consisting of subgenital plate, spermathecae, and, in *Atrichopogon*, genital armatures. Spermathecae usually chitinized, and their shape and number often useful in classification. Measured under  $600\times$  magnification. Subgenital plate rather difficult to examine, being concealed between sternites 8 and 9, but when abdomen is dissected horizontally it may be clearly shown in ventral aspect. We have described this structure in the species of *Dasyhelea*.

These midges received little attention from early dipterists because of their minute size, except for a few investigators such as Winnertz (1852), who studied the European species, and Coquillett (1899-1905), the American species. However, after Kieffer's epochal work in 1906 (*Genera Insectorum* 42), Malloch (1914-1917) proposed the Ceratopogonidae as a distinct family and studied both larvae and adults of the American species. In 1920, Goetghebuer monographed the Belgian species and in 1933-1934 published a treatise on the Palaearctic species. In 1925, Kieffer reported on the French species.



Edwards (1926) supported Malloch's proposal to separate this group from the Chironomidae (or Tendipedidae) as a distinct family, *Ceratopogonidae*, in his paper "On the British Biting Midges." After these publications, the *Ceratopogonidae* (or *Heleidae*), which include many important economic pests, drew the attention of dipterists. In Germany, Thienemann (1928-present), Mayer (1934-1938), and Lenz (1934) studied mainly the metamorphosis. In 1928-1929 Thienemann conducted a hydrobiological expedition in Java, Sumatra, and Bali and the results related to the group have been reported by Johannsen (1931) and Mayer (1934). Macfie (1932-1948) and de Meillon (1931-1939) worked on the African fauna. Tokunaga (1932-1941) monographed the Japanese and Micronesian species and now (1951-present) is studying this family in Japan and neighboring countries, and New Guinea. Lee (1948-1949), Fox (1942-1946), Wirth (1952), and Kettle (1949-1955) are actively working on the Australasian species, the Neotropical *Culicoides*, the North American species, and the British *Culicoides*.

To find a natural system of classification of the family which can be satisfactorily applied to both adults and immature forms is very difficult. Different authors have proposed various numbers of groups or subfamilies. Edwards (1926) subdivided it into two groups: The first group includes *Culicoides*, *Forcipomyia*, and *Atrichopogon*, the females of which frequently have blood-sucking habits or attack either vertebrates or other insects much larger than themselves; and the second group includes *Palpomyia*, *Bezzia*, *Stilobezzia*, the females of which are predaceous on other small insects. Kieffer (1925) proposed five groups for adult forms: *Forcipomyia*, *Dasyhelea*, *Culicoides*, *Palpomyia*, and *Bezzia*; and three groups on the larval forms: a genuine group including *Forcipomyia* and *Atrichopogon*; an intermediate group including *Dasyhelea*; and a vermiform group including *Culicoides*, *Stilobezzia*, *Bezzia*, and *Palpomyia*. Mayer (1934) subdivided this family into six groups: *Forcipomyia*, *Dasyhelea*, *Culicoides*, *Stilobezzia*, *Palpomyia*, and *Leptoconops*, chiefly upon the structure of the mouthparts and pharyngeal sclerites of the larvae. Thomsen (1937), Macfie (1940), and Johannsen (1943) generally followed Mayer's system. Recently Wirth (1952) subdivided this family into four subfamilies: *Leptoconopinae*, *Dasyheleinae*, *Forcipomyiinae*, and *Heleinae*. Wirth's last subfamily includes Mayer's three groups: *Culicoides*, *Stilobezzia*, and *Palpomyia* taken together with *Helea*. Although Wirth's system seems to be most acceptable as a natural one, related to confirmation of his "Heleinae," closer discussion may be necessary to show the more intimate evolutionary relationship between adults and immature forms. In this paper, therefore, we do not classify the family into subfamilies.

The classification adopted in this report is based mainly upon Kieffer's system, partially modified and supplemented by Edwards, Goetghebuer, Kieffer, and Wirth.



## Distribution of Micronesian Ceratopogonidae

	MICRONESIAN ISLAND GROUPS										Other Localities	
	Bonin	N. Mariana	S. Mariana	Caroline						Marshall		Gilbert
				Palau	Yap	Caroline Atolls	Truk	Ponape	Kusaie			
34. <i>F. (Trichohelea) oligarthra</i>				×								Puerto Rico, British West India, British Guiana, Mexico, Cuba
35. <i>F. (T.) sabroskyi*</i>				×				×	×			
36. <i>F. (T.) hamaticauda*</i>				×								
37. <i>F. (Subgen. A) carolinea*</i>				×								
38. <i>F. (Subgen. B) fuscimanus</i>			×	×		×	×	×	×	×		Formosa
39. <i>F. (Subgen. C) deminuta*</i>				×				×				
40. <i>F. (Lasiohelea) carolinensis</i>		×		×	×			×	×			
41. <i>F. (L.) stimulans</i>					×							Brazil (?), NW and C. Africa (?), Ceylon (?), Sumatra, Java
42. <i>F. (L.) ancoriformis*</i>					×							
43. <i>F. (L.) spinipenis*</i>				×								
44. <i>F. (Pterobosca) feminae</i>				×		×						
45. <i>F. (P.) fidens</i>										×	×	Hainan I., Ryukyus
46. <i>F. (P.) esakia</i>			×									Java, New Guinea
47. <i>F. (P.) adhesipes</i>								×				
48. <i>F. (P.) chrysopae*</i>				×								
49. <i>Dasyhelea esakii</i>				×	×	×	×	×	×	×	×	
50. <i>D. nigristigmata*</i>										×		
51. <i>D. flavicaudalis*</i>						×		×	×			
52. <i>D. flavescens*</i>			×	×	×			×		×	×	
53. <i>D. gressitti*</i>				×								
54. <i>D. sp. No. 1.</i>										×		
55. <i>D. sp. No. 2.</i>				×								
56. <i>D. flavibasalis</i>								×		×		
57. <i>D. raripilosa</i>				×								
58. <i>D. parvistylata*</i>				×	×							
59. <i>D. sp. No. 3.</i>					×							
60. <i>D. subscutellata</i>			×	×			×	×				
61. <i>D. dupliforceps*</i>											×	
62. <i>D. townesi*</i>			×			×				×		
63. <i>D. pallivittae*</i>									×	×		
64. <i>D. vittula*</i>		×	G	×				×				
65. <i>D. sabroskyi*</i>				×								
66. <i>D. furcillifera*</i>				×	×							
67. <i>D. palauensis</i>			×	×	×		×	×		×	×	

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	Bonin	N. Mariana	S. Mariana	Caroline						Marshall		Gilbert
				Palau	Yap	Caroline Atolls	Truk	Ponape	Kusaie			
68. <i>D. sp. No. 4.</i>			X									
69. <i>D. sp. No. 5.</i>			X	X								
70. <i>D. sp. No. 6.</i>			X	X	X							
71. <i>D. carolinensis</i>				X			X	X				
72. <i>D. sp. No. 7.</i>											X	
73. <i>D. perfida</i>	X	X	X	X	X	X	X	X	X	X		Java
74. <i>D. subperfida</i>			X	X	X		X	X	X			
75. <i>D. dybasi*</i>				X				X				
76. <i>D. sagittifera*</i>			X	X						X		
77. <i>D. quarternihamata*</i>			X			X	X	X		X		
78. <i>D. truncata*</i>				X								
79. <i>D. palloris*</i>			X									
80. <i>D. insularis</i>			X	X		X		X	X		X	
81. <i>D. nigroris*</i>			G				X	X				
82. <i>D. peliliouensis</i>			X	X	X	X	X	X	X	X	X	
83. <i>D. insulicola*</i>				X	X				X	X		
84. <i>D. fumala</i>			G	X	X	X		X	X	X		
85. <i>D. nigripygma*</i>				X					X			
86. <i>D. striipennis*</i>				X					X			
87. <i>D. sp. No. 8.</i>											X	
88. <i>D. sp. No. 9.</i>			X	X								
89. <i>D. sp. No. 10.</i>							X					
90. <i>D. sp. No. 11.</i>			X									
91. <i>D. sp. No. 12.</i>				X								
92. <i>D. multifascia*</i>								X				
93. <i>Culicoides ardentissimus</i>				X	X				X			
94. <i>C. kusaiensis</i>					X			X	X	X		
95. <i>C. guttifer</i>			G	X			X					Java, Sumatra, Malaya
96. <i>C. yoshimurai</i>							X	X	X			
97. <i>C. yasumatsui</i>				X			X		X			
98. <i>C. flavimaculinalis</i>				X	X			X				
99. <i>C. sabroskyi*</i>				X								
100. <i>C. claggi*</i>	X											
101. <i>C. peregrinus</i>				X	X							E. India, Seychelles Is., Assam, Philippines, Java, Malaya, Sumatra, Formosa
102. <i>C. peliliouensis</i>				X	X		X	X				
103. <i>C. esakii</i>				X	X			X	X			
104. <i>C. obscurus*</i>				X								
105. <i>C. palauensis*</i>				X								
106. <i>Ceratopogon insulicolus*</i>					X							
107. <i>Alluaudomyia maculosipennis</i>				X	X			X				Formosa

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	Bonin	N. Mariana	S. Mariana	Caroline						Marshall		Gilbert
				Palau	Yap	Caroline Atolls	Truk	Ponape	Kusaie			
108. <i>A. monopunctata</i> *								×				
109. <i>A. bipunctata</i> *				×	×							
110. <i>A. insulana</i> *							×		×			
111. <i>A. insulicola</i> *								×				
112. <i>Stilobezzia</i> (Eukraiohelea) <i>esakiana</i>			G	×	×			×				
113. <i>S. pallidicornis</i> *				×								
114. <i>S. esakii</i>				×								
115. <i>S. albiabdominalis</i> *								×				
116. <i>S. spadicitibialis</i> *							×	×				
117. <i>S. gressitti</i> *								×				
118. <i>S. fuscigenua</i> *				×	×							
119. <i>S. fusciscutellata</i>					×		×					
120. <i>S.</i> ( <i>Neostilobezzia</i> ) <i>unifascidorsalis</i> *				×								
121. <i>S.</i> ( <i>N.</i> ) <i>calcaris</i>				×	×			×				
122. <i>S.</i> ( <i>N.</i> ) <i>tenuiforceps</i> *				×								
123. <i>S.</i> ( <i>N.</i> ) <i>latiforceps</i> *				×	×							
124. <i>S.</i> ( <i>N.</i> ) <i>latiforceps setigera</i> *				×								
125. <i>S.</i> ( <i>N.</i> ) <i>truncata</i> *				×	×							
126. <i>S. longistyla</i>							×					
127. <i>S. fusistylata</i> *				×	×			×				
128. <i>S. setigeriscutellata</i> *								×				
129. <i>S. spadicicoxalis</i> *				×	×		×	×				
130. <i>S. subsoror</i>				×			×	×				
131. <i>S. fulviscuta</i> *				×	×		×	×				
132. <i>Serromyia esakii</i>				×					×			
133. <i>Monohalea insularis</i>				×			×		×			
134. <i>M.</i> ( <i>Schizohalea</i> ) <i>albiclavatoris</i> *							×					
135. <i>M. palauensis</i> *				×								
136. <i>M. mcdanieli</i> *				×								
137. <i>Palpomyia sabroskyi</i> *				×	×							
138. <i>Sphaeromyia kraussi</i> *			G									
139. <i>Bezzia adamsi</i> *								×				
140. <i>B. badiifemorata</i> *								×				
141. <i>B. spinositibialis</i> *				×	×							
142. <i>B. clarkei</i> *									×			
143. <i>B. maculifemorata</i> *				×				×				
144. <i>B. sulfureicruris</i> *								×				
145. <i>B. pediaureola</i> *								×				
146. <i>B. nigrialula</i> *				×								
147. <i>B. nigrofasciata</i> *					×							

\* Described as new.

† G under *S. Mariana* indicates Guam only.

## SYSTEMATICS

## FAMILY CERATOPOGONIDAE

*Ceratopogonites* Newman (1834), *Ceratopogonina* Skuse (1889), *Ceratopogoninae* Lynch-Arribalzaga (1893), *Ceratopogonidae* Malloch (1917), *Stenoxenidae* Coquillett (1899), *Stenoxeninae* Kieffer (1906), *Leptoconopinae* Noe (1907), *Heleinae* Speiser (1910), *Johannsenomydidae* Crampton (1925), *Forcipomyiinae* Lenz (1934), *Dasyheleinae* Lenz (1934), *Brachypogoninae* Enderlein (1936) and *Palpomyiinae* Enderlein (1936).

Body small or minute, at most about 5 mm. long, usually about 1-3 mm. Head round, with mouthparts complete, provided with well-developed mandibles, blade-like maxillae, and five-segmented maxillary palp; segment 3 of palp with sensory organs. Ocelli absent. Antenna 14-segmented, with scape large and globular; in male flagellar segments with plumose hairs and distal three or four segments lengthened, and in female without plumose hairs and distal five segments different in character from basal ones. Thorax rather round, with scutellum usually more or less setose, postscutellum without median longitudinal furrow or keel, sternopleurite not very prominent, barely reaching tips of fore coxae. Legs rather short and stout, hind legs longest and when at rest body supported by three pairs of legs; hind tibia with double comb at tip; pulvilli never present. Wings superimposed over the back when at rest, with alula scarcely indicated and bearing minute sclerite at base of caudal margin and squama small and bearing single seta or tuft of hairs, but never with complete fringe. Vein Rs simple or bifurcate into  $R_{2+3}$  and  $R_{4+5}$ . When  $R_{2+3}$  present, always extends upward resembling cross vein and ending in  $R_1$ .  $M_1$  and  $M_2$  almost always present but  $M_2$  often atrophied at base or, rarely, completely atrophied;  $M_{3+4}$  represented only by distal section arising from stem part of  $Cu_1$ , and its basal section (between M and  $Cu_1$ ) completely atrophied. Male hypopygium more or less rotated at segment 8; tergite 9 usually with paired anal points on caudal margin; coxites and styles well developed; aedeagus distinct and sclerotic; parameres distinct and well chitinated. Spermathecae strongly chitinated.

The Ceratopogonidae is very closely related to the Chironomidae in several important respects, but the well-developed mouthparts and the presence of wing veins  $M_1$ ,  $M_2$ , and  $R_{2+3}$  in the former are the most obvious distinctions.

## KEY TO GENERA OF MICRONESIAN CERATOPOGONIDAE

1. Wing without r-m cross vein, with vein-like longitudinal fold between R-Rs and M- $M_1$ ; antenna of female 12- or 13-segmented.....*Leptoconops*  
 Wing with distinct r-m cross vein, without vein-like longitudinal fold between R-Rs and M- $M_1$ ; antenna of female 14-segmented..... 2
- 2(1). Leg with well-developed empodium as long as claws, at least in female [empodium usually vestigial and hairlike in males of *Forcipomyia* (*Trichohalea*), but other characters quite similar to those of *Forcipomyia*].... 3  
 Leg with slender hairlike, short or vestigial empodium..... 4
- 3(2). Wing with dense decumbent and elongate or often scale-like macrotrichia over surface, microtrichia minute; first radial cell narrow or often obliterated; second radial cell usually short, about as long as first cell; costa usually extending not far beyond middle of wing (in subgenus *Lasiohelea*, second radial cell usually somewhat longer than first cell and

- costa ending more or less beyond middle of wing, but first radial cell obliterated and wing membrane densely covered with decumbent or suberect macrotrichia entirely as in other *Forcipomyia*).....**Forcipomyia**
- Wing with sparse, erect macrotrichia, sometimes only on apical membrane or absent; first radial cell small but distinct, second radial cell distinctly longer than first cell; costa reaching well beyond middle of wing, usually extending to two-thirds of wing.....**Atrichopogon**
- 4(2). Wing without first radial cell, veins  $R_1$  and  $R_s$  completely fused into single vein or sometimes with linear first cell, these two veins being arranged side by side; second radial cell very short, squarely or subsquarely ended; costa generally ending about at middle, or not far beyond middle, of wing; macrotrichia usually spread on entire membrane rather sparsely; eyes entirely pubescent; humeral pits not developed; female claws small and equal.....**Dasyhelea**
- Wing with one or two radial cells well developed; second radial cell not markedly square-ended; venation otherwise; costa generally reaching well beyond middle of wing..... 5
- 5(4).  $fm_{1+2}$  petiolate,  $M_1$  and  $M_2$  forked beyond end of r-m cross vein..... 6
- $fm_{1+2}$  sessile,  $M_1$  and  $M_2$  forked at or before end of r-m cross vein.....11
- 6(5). Humeral pits of scutum present and conspicuous; wing with microtrichia of membrane distinct, and macrotrichia usually abundant; two radial cells subequal in length; claws of female small, equal, and simple.....**Culicoides**
- Humeral pits of scutum usually small; wing without or with microtrichia of wing membrane and macrotrichia absent or scanty; claws of female large, equal, or very unequal..... 7
- 7(6). Wing without microtrichia; wing membrane more or less milky white in dry state; two radial cells subequal..... 8
- Wing with microtrichia; wing membrane not milky white in dry state; second radial cell distinctly longer than first..... 9
- 8(7). Claws of hind leg of female equal; wing unmarked; macrotrichia of membrane scanty or absent.....**Ceratopogon**
- Claws of hind leg of female unequal; wing with one to many small dark, or brown, spots; macrotrichia of membrane rather numerous.....**Alluaudomyia**
- 9(7). Claws of female distinctly unequal on all legs; tarsal segment 4 of legs bilobed .....**Stilobezzia**
- Claws of fore and middle legs of female equal; tarsal segment 4 of legs cylindrical to cordate.....10
- 10(9). Hind femur greatly swollen and armed with numerous spines on ventral side; hind tibia slender; tarsal segment 4 of legs subcordate.....**Serromyia**
- Hind femur moderately swollen and without spines on ventral side; hind tibia somewhat thickened; tarsal segment 4 of legs subcylindrical.....**Monohalea**
- 11(5). Wing with two distinct radial cells, separated by  $R_{2+3}$ .....12
- Wing with one large radial cell,  $R_{2+3}$  absent.....**Bezzia**
- 12(11). All femora without spines on ventral side.....13
- Femur, at least on fore leg, armed with spines on ventral side.....15
- 13(12). Tarsal segment 5 slender in female and with long black spines below.....
- .....**Johannsenomyia**
- Tarsal segment 5 unarmed ventrally and that of fore leg inflated.....14
- 14(13). Claws of hind leg of female unequal; tarsal segment 4 deeply bilobed and armed with spines on middle and hind legs; costa not prolonged beyond tip of  $R_{4+5}$ .....**Clinohalea**
- Claws of hind leg of female equal; tarsal segment 4 cordate and unarmed; costa prolonged beyond tip of  $R_{4+5}$ .....**Neurohelea**

- 15(12). Tarsal segment 5 of female armed beneath with long, blunt, black spines;  
 tarsal segment 4 short and subcylindrical.....**Sphaeromias**  
 Tarsal segment 5 of female without long, blunt, black spines beneath,  
 rarely with fine, sharp spines; tarsal segment 4 cordate.....**Palpomyia**

### Genus *Atrichopogon* Kieffer (1906)

*Didymophleps* Weyenberg (1883), *Kempia* Kieffer (1913), *Ceratopogon* Malloch (1915), *Gymnohelea* Kieffer (1921), *Lophomyidium* Cordero (1929), and *Psilokempia* Enderlein (1936).

Body short and stout, small to minute, slightly hairy. Eyes pubescent or bare. Female antenna with distal five segments cylindrical, much longer than preceding nine segments, which are round or transverse, last segment usually with terminal stylet. Male antenna with slight verticils on segments 11 to 14, segment 11 not greatly lengthened, often much shorter than following distal segments. Mesonotum bare or with fine short hairs only. Legs rather slender, with few or no long setae; hind basitarsus always at least twice as long as second; empodium always well developed. Wings broad in female and somewhat narrow in male; anal lobe more rounded than in *Forcipomyia*; microtrichia always well developed; macrotrichia less dense and also finer and more erect than in *Forcipomyia* and often confined to wing tip or absent, usually very much reduced in male. Venation: Costa reaching beyond middle of wing, usually to two-thirds of wing; second radial cell narrow and long, generally at least twice as long as first; distinct intercalary fork in cell  $R_5$ ; median fork with short stem, lower branch not, or scarcely, interrupted at base; anal vein straight. Alula and squama bare. Female abdomen often with median appendage on sternites 6 or 7; one or two spermathecae. Male hypopygium with sternite 9 short, transverse; tergite 9 round on caudal margin and without anal processes; aedeagus rather simple; parameres highly reduced or absent.

Some workers subdivide this genus into *Atrichopogon* (*s. str.*) and *Kempia* Kieffer, but recently Wirth (1952, Univ. California, Pub. Ent. 9 (2): 95-266) reported that the pubescent eyes, which are the chief sub-generic character of *Kempia*, are so variable (some species have eyes pubescent only above, others only below) that it is definitely unworkable. We agree with Wirth.

### KEY TO MICRONESIAN SPECIES OF ATRICHOPOGON

1. Compound eyes quite bare. In male, antenna normal, being 14-segmented, segment 11 far shorter than 12 and about one and one-half times or twice as long as 10..... 2
- Compound eyes entirely or partially pubescent. In male, antenna normally segmented or ten-segmented..... 4
- 2(1). Scutum with two brown lateral vittae widely separated by a broad, yellow, median vitta.....**1. snyderi**
- Scutum without distinct vittae..... 3
- 3(2). Scutellum with six to eight strong bristles and eight to ten small setae along caudal margin; in male, wing without macrotrichia on membrane.....**2. jacobsoni**
- Scutellum with only four strong bristles and without small accessory setae; in male, wing with sparse macrotrichia on distal parts of cells  $R_5$  and  $M_1$ .....**3. raripilipennis**



- 4(1). Mesoscutum with ten large, yellow spots in dark ground color. In female, sternite 7 with blunt, spinous, median caudal lobe and sternite 8 with a pair of tufts of very long, black bristles. In male, hypopygium with very strong, rod-like structure beneath aedeagus.....4. *fenestriscutum*  
Mesoscutum with only one pair of window-like pale spots on caudoscuteal area just before scutellum or without distinct yellow spots..... 5
- 5(4). Wing with sparse macrotrichia on apical area.....5. *arciforceps*  
Wing without macrotrichia on membrane..... 6
- 6(5). Mesoscutum brownish pruinose in dry state and with yellowish stripes on foveae in mounted specimens. In female, ventral side of caudal abdominal segments with spines or setigerous processes. In male, caudal membrane of sternite 9 bare..... 7  
Mesoscutum entirely dark brown or brown. In female, ventral side of caudal abdominal segments without special processes. In male, caudal membrane of sternite 9 spinulose..... 8
- 7(6). Mesoscutum without window-like pale spots on caudoscuteal area. In male, styles of hypopygium distinctly tapered and strongly curved at preapical parts. In female, sternite 7 with fork-like median caudal process.....7. *armatocaudalis*  
Mesoscutum with a pair of window-like pale spots on caudoscuteal area just before scutellum. In male, styles of hypopygium entirely slender and slightly arcuate. In female, sternite 7 without fork-like median caudal process.....6. *spinicaudalis*
- 8(6). Halteres brown or fuscous brown.....8. *flavenicruris*  
Halteres yellow or white..... 9
- 9(8). In male, antennae 14-segmented. Tarsal claws with a stout middle tooth on each lateral side. Abdominal apex yellow, differing from preceding fuscous or brown segments.....9. *gressitti*  
In male antennae ten-segmented. Tarsal claws with a minute hyaline middle tooth on each lateral side. Abdominal apex brownish, similar to other segments.....10. *brevicornis*

# 1. *Atrichopogon snyderi* Tokunaga, n. sp. (fig. 1).

Medium-sized brown and yellow. Male antenna with segment 11 rather short, twice as long as 10 and about one-third of 12; female antenna with basal short flagellar segments subspherical and AR about 2.34. Scutum with lateral vittae broad, brown or dark, and widely separated by median yellow vitta; scutellum yellow or slightly fuscous yellow and with six strong bristles. Legs mainly pale yellowish, but tarsal segments more or less brownish, especially on distal two segments; male hind TR about 2.52 and female about 2.29-2.50. Male wing with macrotrichia very sparse, spread only on apical margins of cells  $R_4$  and  $M_1$ ; female wing with more numerous macrotrichia, but quite bare between  $M$  and stem of  $fMCu$ ;  $fM$  with petiole very short,  $Cu_1$  of female wing slightly undulate. Male hypopygium with tergite 9 elongate, coxites swollen and oval and styles very stout, arcuate and with minute preapical tooth. Spermatheca very large and elongate-oval.

*Male*: Body about 2.98 mm. long. Wing about 1.64 mm. by 0.47 mm.

Head brown, with eyes quite bare and broadly contiguous above, clypeus with about eight setae, mouthparts yellow, proboscis little longer than half of height of head capsule (18:30). Maxillary palp slender, very pale, but gradually more fuscous on apical segments, segment 3 slender and with a sensory pore at middle and five segments in proportion of about 13:20:23:13:13. Antenna with scape brown, other segments and plumose hairs rather pale brown; relative length of segments 2 to 10, 11 to 14, 2 to 11 and 12 to 14 together about 126:223 and 148:201 respectively, those of apical eight segments about 13.5:13:13:12.5:22:67:55.5:79.

Thorax mainly yellow and brown; scutum with lateral vittae brown, broad and widely separated by yellow median vitta, where dark rings of setal bases are distinct, humeral parts white; paratergites brown; pleural sides brown on upper half and yellow on lower half; sternal sides yellow; scutellum yellow and with six strong dark bristles and about ten minute setae. Legs with coxae, trochanters and basal half of femora white, apical half of femora and entire length of tibiae yellow, tarsi pale brownish yellow; relative length of leg segments, except for basal two, about 192:188:102:39:32:25:25 in fore, 230:215:103:42:34:24:24 in middle, and 249:244:125:54:41:27:26 in hind leg; hind leg with TR about 2.32, hind tibial comb with nine apical bristles, all claws slightly bifid at apices.

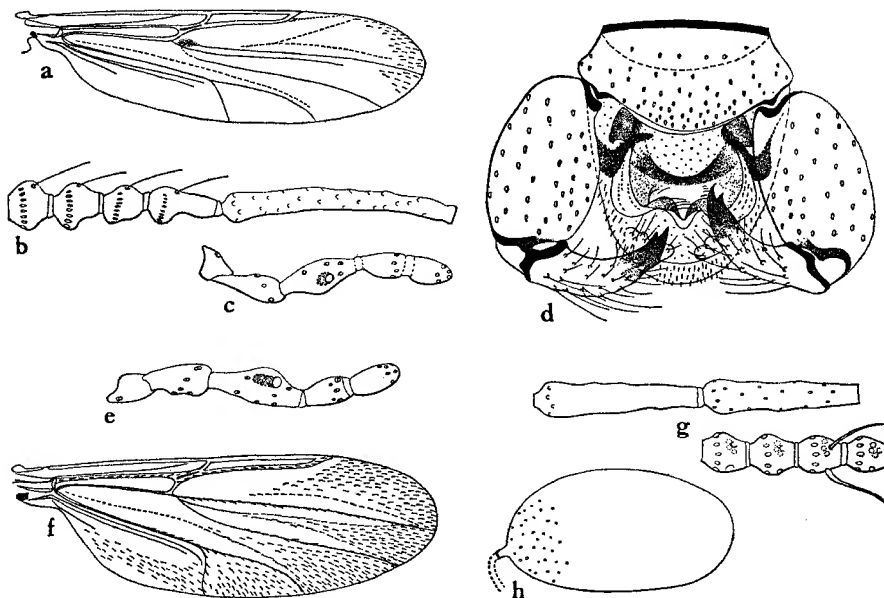


FIGURE 1.—*Atrichopogon snyderi*. a-d, male: a, wing; b, antennal segments 8 to 12; c, maxillary palp; d, hypopygium. e-h, female: e, maxillary palp; f, wing; g, antennal segments 6 to 11; h, spermatheca.

Wing very pale brownish yellow including veins and macrotrichia, with faint, small, brown cloud at base of vein  $M_1$ , macrotrichia very sparse and spread only on apical parts of cells  $R_5$  and  $M_1$ . Venation: Costa ending at basal 0.7 of wing length (91:126), slightly before level of tip of  $M_{3+4}$  and little produced beyond end of  $R_5$ , proportional length of  $R$ ,  $M$ , and stem of  $fMCu$  about 40:38:55,  $R_5$  3.8 times as long as  $R_1$  (38:10), second radial cell about four times as long as first cell, which is slit-like and very narrow,  $M_{1+2}$  almost as long as  $r-m$  (3:4), base of  $M_2$  obscure,  $M_{3+4}$  about 2.5 times as long as  $Cu_1$  (35:13),  $Cu_1$  almost straight,  $fMCu$  just under tip of  $R_1$  and inner angle about 50 degrees. Haltere with stem yellow and knob white.

Abdomen with tergites and sternites brown and square, pleural membranes pale brown. Hypopygium dark brown; tergite 9 elongate, almost as long as basal width (80:84) and round on caudal margin; sternite 9 transverse, about half as long as wide (42:84), highly setigerous, especially on middle part of caudal margin, and without caudal concavity. Coxites expanded laterad, oval, about 1.6 times as long as wide (70:43), with

basal projection well developed; styles very thick, little shorter than coxites (66:70), strongly arcuate, highly setigerous, dark on apical quarter and with preapical minute tooth besides apical larger tooth. Aedeagus very broad, with shoulder parts bluntly produced, median caudal lobe papilliform, basal arch about half as long as total length.

*Female*: Body length 2.28-2.54 mm. Wing about 1.69-1.86 mm. by 0.59-0.64 mm. Coloration generally as in male, but thorax and legs somewhat darker or more brownish, but paratergites yellow. In dry specimens shoulder parts of scutum slightly brown-pruinose.

Head with vertex brown, frons and mouthparts yellowish brown, clypeus with about nine setae, proboscis far longer than half of length of head capsule (20:33). Maxillary palp with basal part yellow, segment 3 apically fuscous, 4 to 5 fuscous; five segments in proportion of 14.5:18.5:25:14:14. Antenna with scape fuscous yellow, flagellum dark, basal short flagellar segments subspherical to short-oval; segments 10 to 13 five or six times as long as basal width (41-51.5:8-8.5) and ultimate about eight times (63-64.8). AR 2.34 (2.31-2.36); eight distal segments in proportion of 11.8:11.8:12.3:44.3:42.5:49.5:50.3:63.8.

Thorax with paratergites yellow; scutum somewhat fuscous on anterior margin of middle part, with two lateral vittae dark and pair of white spots on caudoscuteal area more distinct than in male; pleural sides brown on dorsal half and whitish yellow on ventral half, sternal side yellow; scutellum slightly fuscous and with more minute small setae than in male. Legs with tarsi more distinctly brownish apically than in male; hind tibial comb with ten or 11 apical bristles; claws simple; hind TR 2.29-2.51; leg segments, except for basal two, in proportion of 175:177:101.5:35.5:29.5:21.5:21.5 in fore, 223.5:220.5:124:40.3:31:21.8:22.8 in middle, and 241:223:128.5:53.5:39:24.5:24.5 in hind leg.

Wing with macrotrichia rather sparse, bare areas along veins very broad, no macrotrichia on basal one-third of cell  $R_5$  and  $M_1$  and between M and stem of fMCu. Venation: Costa extending basal 0.78 of wing length (107:136), little produced beyond tip of  $R_s$  as long as r-m, and ending beyond level of tip of  $M_{3+4}$ , relative length of R, M, and stem of fMCu about 39:39:55.5,  $R_s$  about four times as long as  $R_1$  (49.5:12.5), first radial cell slit-like, second cell long and far longer than four times first (38:8.1),  $M_{1+2}$  very short and a little shorter than r-m, fMCu under tip of  $R_1$  and its inner angle about 65 degrees,  $M_{3+4}$  about 2.5 times as long as  $Cu_1$  (35:13.5),  $Cu_1$  undulate and meeting anal margin at right angle.

Abdomen with tergites and sternites fuscous brown, pleural membranes very pale; cerci fuscous yellow; single spermatheca very large (3.5-83.5 by 44 units), oval, dark, with small chitinated part of duct and hyaline punctures before duct.

Holotype, male (US 64585) in copula with allotype, Okimura, Haha Jima, Bonin Islands, Apr. 26-May 9, 1958, Snyder. Allotype, female (US) in copula with holotype. Paratypes, female (US) with types; male, Senzan, Ani Jima, Bonin Is., May 28, female (BISHOP) Minato-ko, Yatsuse Reg., Chichi Jima, Bonin Is., Apr. 10-22, female, Kammuri-iwa, Ototo Jima, Bonin Is., June 3, all 1958, Snyder.

DISTRIBUTION: Bonin Is.

This species is very closely allied to New Guinea *A. bifasciatus* Kieffer. In the allied species, however, the female AR is larger, 2.66 instead of 2.34 of the present species, the postscutellum is uniformly yellow, vein  $M_{3+4}$  of female wing is strongly arcuate and  $Cu_1$  is more distinctly undulate, differing from the present species. Another allied species may be New Guinea *A. pallidipedis* Tokunaga, but in this allied species the scutellum has four strong

bristles, the male wing has no macrotrichia even on the apical part, and the coxites and styles of the male hypopygium are not swollen or thickened, differing from the present new species.

**2. *Atrichopogon jacobsoni* (de Meijere). (Figure 2.)**

*Ceratopogon jacobsoni* de Meijere, 1907, Tijdschr. Ent. 50: 212.

*Atrichopogon flavellus* Kieffer, 1913, Indian Mus., Rec. 9: 177.—Tokunaga, 1940, Philippine Jour. Sci. 71 (2): 211.

*Atrichopogon immaculatus* Kieffer, 1917, Mus. Nat. Hungarici, Ann. 15: 181.

*Atrichopogon cavernarum* Edwards, 1924, Indian Mus., Rec. 26: 107.

*Atrichopogon jacobsoni* Edwards, 1928, Insects of Samoa 6 (2): 52.—Johannsen, 1932, Archiv Hydrobiol., Suppl. 9, Tropische Binnengewässer 2: 415.—Tokunaga, 1940, Tenthredo 3 (2): 171.

*Atrichopogon rarus* Johannsen, 1946, B. P. Bishop Mus., Bull. 189: 188.

Yellow, orange-yellow, or yellowish-white (coloration variously reported from black to yellow by different authors); eyes bare; scutellum usually with six, and rarely seven or eight, strong bristles and six to nine small setae along caudal margin. In female, AR large, 2.88; wing with macrotrichia on apical and anal areas, costa very long, about 0.8 of wing, second radial cell also long, 3.6 times as long as first cell, inner angle of fMCu large, 60 degrees or more, and Cu<sub>1</sub> meeting anal margin at a 90 degree angle. In male, distal three antennal segments very long, segment 11 about one-third as long as following segment and about twice as long as preceding one; wing without macrotrichia; styles of hypopygium showing two forms: usually styles tapered gradually and with an apical and minute preapical tooth; rarely styles thicker on basal two-thirds and narrowed on apical one-third, without preapical tooth.

*Male*: Body length 3.23 (2.7-3.4) mm. Wing about 1.9 mm. by 0.53 mm. Integument of body mainly yellowish.

Head brown, with eyes bare and broadly contiguous above, mouthparts pale brown, rather long, and fully 0.7 as long as height of head capsule; clypeus with ten to 11 setae. Maxillary palp rather slender, segment 3 with large sensory pore at middle, five segments in proportion of 16.8:22.6:33:13.8:17.6, last segment usually longer than penultimate but in some specimens subequal to penultimate. Antenna with scape yellow, segments 2 to 10 yellowish brown, segments 11 to 14 and plumose hairs brown, eight distal segments in proportion of 19.5:17.5:16.8:15.8:28.8:89.5:67.5:95.5; combined length of segments 2 to 10, 2 to 11, 11 to 14, and 12 to 14 in proportion of 170.2:199:279.2:250.5.

Thorax yellowish, scutum with humeral areas and caudoscuteal area yellowish white or paler, scutellum yellow, with six strong bristles and six or seven small setae along caudal margin and two to five small setae on anterior half. Legs yellow, but tarsi yellowish pale brown to pale brown, with claws minutely bifid at extreme tip; proportion of leg segments, except for coxae and trochanters, about 53.2:55:34:12.1:8.3:5.2:5.7 in fore leg, 59.4:62.2:41.9:14.2:10:5.7:6 in middle leg, and 64.8:63.4:44.8:18.2:11.5:6.9:6.1 in hind leg.

Wing with veins very pale brown, without macrotrichia. Venation: Costa very long, about 0.76 of wing (111.6:147.6), slightly produced beyond tip of Rs, Rs as long as R and about 3.8 times as long as R<sub>1</sub>, relative length of R, R<sub>1</sub>, Rs, and stem of fMCu about 47.8:12.8:47.2:64.4. Second radial cell long and almost 3.9 times as long as first cell (36.2:9.3); fMCu at level of tip of R<sub>1</sub>; tips of Rs above tip of M<sub>3+4</sub>; Cu<sub>1</sub> meeting anal wing margin at about 90 degree angle, wing margin slightly concave at end of Cu<sub>1</sub>. Haltere white or yellowish white.

Abdomen pale brown. Hypopygium also pale brown, but tips of styles broadly dark; sternite 9 about three times as broad as long at caudal margin, with about 12 to 16 setae arranged in a transverse line at middle and three to ten setae along middle part of caudal margin, caudal membranous area finely spinulose; tergite 9 semicircular. Coxites rather long, about twice as long as basal width, slightly tapered, basal roots simple and horn-like; styles shorter than coxites (41:51), usually slightly curved evenly, very gradually tapered throughout entire length, and with minute preapical tooth, but in rare cases styles thicker on basal two-thirds, tapered gradually, more slender on apical one-third, ending in a simple pointed tip. Aedeagus broad, with basal arch low, median part swollen ventrad longitudinally, slightly projected caudad, and ending in a trilobed tip, main part of aedeagus almost round at caudal margin, and shoulder parts obtuse; parameres absent.

*Female*: Body about 2.84 (2.3-3.2) mm. long. Wing about 1.87 (1.69-2.04) mm. by 0.72 (0.62-0.78) mm. Size of body rather variable. General structure as in male with usual sexual differences.

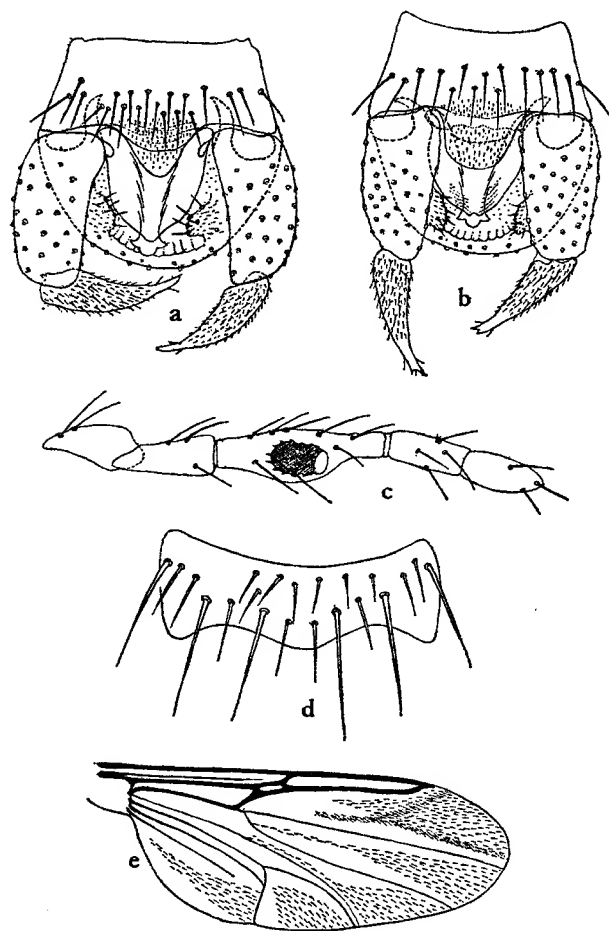


FIGURE 2.—*Atrichopogon jacobsoni*. a, b, male: a, hypopygium with simple styles; b, hypopygium with dentate styles. c-e, female: c, maxillary palp; d, scutellum; e, wing.

Head yellowish brown; clypeus elongate, twice as long as middle width, and with about 12 setae; proboscis rather long, slightly shorter than height of head capsule. Maxillary palp with five segments in proportion of 20.5:22:40:18:17, segment 3 swollen ventrad at middle one-half, and apical one-quarter more slender than basal. Antenna with basal eight flagellar segments very short, distal five elongate and cylindrical; AR about 2.82; relative length of distal eight segments about 12.7:12.7:13.2:54.3:54.3:59.7:62:77.

Thorax yellow to orange yellow, scutum with paler vittae along foveae and caudoscuteal area paler; scutellum normally with six strong bristles, but rarely one or two additional bristles. Legs yellow, but tarsi pale brown or brown; proportion of leg segments 53.7:54.3:32.3:10.5:7.3:5.3:5.8 in fore leg, 60.7:65.3:40:12.8:8.3:5.2:5.7 in middle leg, and 67.3:64.3:44:17.3:10.7:5.8:6.2 in hind leg; claws simple.

Wing with veins pale brown, macrotrichia rather densely arranged on apical one-third and anal area and bare areas along veins very broad. Venation: Costa long, about 0.8 as long as wing (117:146) and slightly produced beyond tip of Rs, Rs longer than R (59.3:41.3) or stem of fMCu (59.3:58.3) and fully 3.6 times as long as R<sub>1</sub> (59.3:16.3), second radial cell long, about 3.5 times as long as first cell (43.3:12), M<sub>1+2</sub> about half as long as cross vein r-m, fMCu under distal half of first radial cell, M<sub>3+4</sub> rather strongly curved, ending at level of distal one-third or one-fourth of second radial cell, Cu<sub>1</sub> very widely divergent from M<sub>3+4</sub>, meeting slightly concave anal margin of wing at about 90 degree angle. Haltere yellow to white.

Abdomen pale brown; with cerci round and brown; single spermatheca dark brown, short oval or round, about 37 by 28.3 units, with many hyaline minute dots on basal area around very short chitinized duct.

DISTRIBUTION: Malay Peninsula, Assam, Java, New Guinea, Philippine Islands, Marquesas, Fiji, Samoa, Tahiti, and Micronesia.

S. MARIANA IS. GUAM: Female, Feb. 1938, Oakley; Pt. Oca, female, May 1945, G. Bohart and Gressitt; Pt. Ritidian, two females, light trap, Aug. 1945, Gressitt; Piti, female, two males, sweeping leaves of *Intsia bijuga*, Sept., Nov. 1936, Swezey; Agat, female, sweeping, Oct. 1936, Swezey.

PALAU. BABELTHUAP: Ngerehelong Pen., four females, May 1957, Sabrosky; 2,225 females and males, swarming beneath leaves of papaya plant, May 1957, Sabrosky; Ulimang, five females, three males, Dec. 1947, Dybas; Ngiwal, 3,887 females and males, swarming and resting on underside of leaves of a small tree, May 1957, Sabrosky; Ngaremlengui, male, female, June 1957, Sabrosky; East Ngatpang, 65 m., four females, Dec. 1952, Gressitt. NGERKABESANG: 3,709 females and males, swarming beneath leaves of a small tree, May 1957, Sabrosky. KOROR: 15 females, eight males, Mar. 1954, Beardsley; seven females, three males, Nov. 1947, 126 females, 110 males, Dec. 1947, Dybas; male, Apr. 1953, Beardsley; female, Apr. 1957, 2,867 females and males, underside of leaves of *Premna* tree, May 1957, female, June 1957, Sabrosky; southwest, 25 m., 36 females, 47 males, Dec. 1953, Gressitt. ULEBSEHEL: Male, Sept. 1952, Krauss; northwest, 12 females, Dec. 1952, Gressitt. ANGAUR: Male, Feb. 1948, Dybas. PELELIU: May 1957, Sabrosky.

YAP. RUMUNG: Female, June 1957, Sabrosky. YAP: Dugor, female, two males, Aug. 1950, Adams; Yaptown, female, July 1946, Townes; six females, July-Aug. 1950, Goss; four females, three males, Oct. 1952, Gressitt; Kolonia, six females, July-Aug. 1950, Goss; hill behind Yaptown, 65 m., four females,

Nov. 1952, Gressitt; S. Yap I., July-Aug. 1950, Goss. GAGIL-TOMIL: Tomil Distr., two females, July-Aug. 1950, Goss.

CAROLINE ATOLLS. IFALUK: Ifaluk I., female, seven males, Aug. 1953, Bates.

TRUK. WENA (MOEN): Male, 30 m., June 1946, Townes: two females, four males, 180 m., July 1946, Townes; Mt. Chukumong, 60 m., two females, Dec. 1952, Feb. 1953, Gressitt; north slope, male, Mar. 1949, Potts. TON: Mt. Unibot, six females, May 1946, Townes; four females, eight males, native forest, 390 m., Dec. 1952, Jan., Mar. 1953, Gressitt. PIS: Two males, June 1946, Townes.

PONAPE. Sokehs I.: Paipalap (Peipalap) Pk., 65 females, 66 males, July 1950, Adams. Ponape I.: 16 females, nine males, Dec. 1954, Davis; Colonia, female, Jan. 1953, Clarke; eight females, nine males, Jan. 1953, Beardsley; Agric. Exper. Sta., five females, male, June-Sept. 1950, Adams; 21 females, 33 males, light trap, Jan. 1953, Gressitt; south of Nanpohnmal, seven females, male, light trap, Jan. 1953, Gressitt; Mt. Temwetemwensekir, 180 m., female, light trap, Jan. 1953, Gressitt; Temwen, 20 females, seven males, Feb. 1936, Ono.

KUSAIE. Pukusrik, 1 m., four females, seven males, light trap, Apr. 1953, Clarke; Mt. Matante, 380 m., three females, light trap, Apr. 1953, Clarke; Hill 1010, two females, three males, Apr. 1953, Clarke; Mutunlik, 36 females, 33 males, Jan. 1953, Gressitt; 20 females, nine males, light trap, Jan.-Apr. 1953, Clarke; Hill 541, female, Mar. 1953, Clarke.

This species is distributed widely through various islands of the Pacific. The coloration is highly variable, but in the mounted condition after dissection the integument is always yellowish, even in the dark specimens. The difference of coloration in dry specimens is probably due to the different coloration of internal organs related to dryness after death. The synonymy of this species was discussed by Edwards (1928), and, after careful research on the paratypes of *A. rarus* Johannsen (Guam), we conclude that it is also synonymous with *A. jacobsoni*.

### 3. *Atrichopogon raripilipennis* Tokunaga and Murachi, n. sp. (fig. 3).

Small, brown; in male, eyes bare, antennal segment 11 shorter than following distal segments, scutellum with only two pairs of strong setae and without minute accessory setae, wings with sparse macrotrichia, only on distal half of cell  $R_5$  and distal area of cell  $M_1$ .

*Male*: Body about 1.66 mm. long. Wing about 1.05 mm. by 0.31 mm.

Head dark brown, frons and mouthparts pale brown; eyes bare and broadly contiguous above, clypeus with a pair of lateral, and five median, setae; proboscis about half as long as vertical length of eye. Maxillary palp with five segments in proportion of 7:12:16:8:10; segment 3 with small sensory pore at middle. Antenna with scape dark brown and other segments and plumose hairs brown; distal eight segments in proportion of 11.5:12:12:12:20.5:42:32.5:45+6.5, segments 2 to 10 and 11 to 14 in proportion of 118:145; ultimate segment with long terminal stylet.

Thorax almost uniformly brown, scutellum brown, with four bristles, and without accessory setae; scutum with pair of obscure paler stripes, somewhat broadened at ends, along foveae and with pair of similarly obscure pale spots along lateral margins of caudal part. Legs with all coxae brown but somewhat paler than thorax, other segments all yellowish pale brown; claws simple; leg segments, except for basal two, in proportion of 113:113:72:22:17:13:14 in fore leg, 135:133:82:21.5:17.5:14:14 in middle leg, and 137:125:83:31.5:22:17:14 in hind leg.

Wing very pale brown on membrane; veins pale brown, macrotrichia very sparse, distributed along outer margin of cell  $R_s$ , on intercalary fork, under tip of vein  $M_1$ , and above tip of  $M_2$ . Venation: Costa extending far beyond middle of wing (57.5:80), slightly produced beyond tip of  $R_s$ , and ending a little before tip of  $M_{3+4}$ , second radial cell large, and about three times as long as first cell (17:5), relative length of  $R$ ,  $R_1$ ,  $R_s$ , and stem

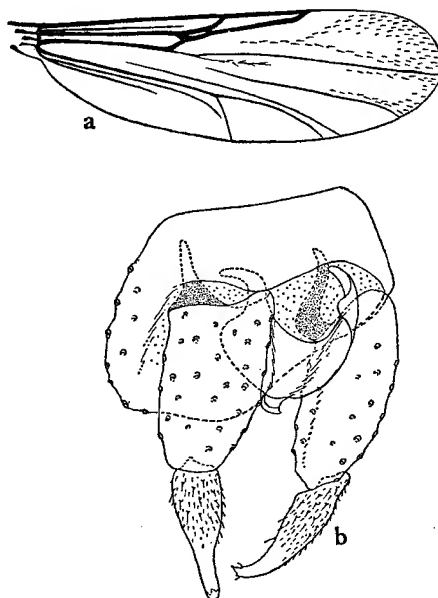


FIGURE 3.—*Atrichopogon raripilipennis*, male: a, wing; b, hypopygium.

of fMCu about 27:6.5:23:35,  $M_1$  ending at tip of wing, fMCu under tip of  $R_1$ , inner angle of fMCu about 60 degrees. Haltere with stem pale brown, knob yellowish white.

Abdomen almost uniformly pale brown. Hypopygium yellowish brown; sternite 9 transverse, caudal margin very shallowly excavate and with about 12 bristles arranged in line along caudal margin, tergite 9 very broad, round, as long as coxites; coxites rather slender, about twice as long as basal width (29.5:14) and each with two distinct basal roots; styles about three-quarters as long as coxites (22:29.5), distinctly tapered, gradually curved, with apices pointed and incurved; aedeagus broad, as long as basal width, basal arch low, basal lateral roots short and pointed, shoulder parts round, median caudal point slightly produced, round, and ending far before tip of tergite 9.

*Female:* Unknown.

Holotype, male (US 64017), Ulebsehel I., Palau Is., Sept. 1952, Krauss.  
DISTRIBUTION: Western Caroline Is. (Palau).



This is named in reference to the sparse macrotrichia of the wings. This species is somewhat allied to a Formosan *A. citrinipes* Kieffer (1922) in coloration and distribution of wing macrotrichia; however, the antennal segmentation is highly different. In *A. citrinipes*, segment 11 is twice as long as 10, 12 is only a little longer than 13 and a little shorter than the ultimate, and the terminal segment is small; in *raripilipennis*, segment 11 is shorter than twice the length of 10, 12 is much longer than 13 and much shorter than the ultimate, and the terminal stylet is rather long.

#### 4. *Atrichopogon fenestriscutum* Tokunaga and Murachi, n. sp. (fig. 4).

Minute dark-brown or black, scutum with many window-like yellow spots to which the species name is related; eyes of both sexes pubescent, legs mainly yellowish, wings without macrotrichia on membrane in both sexes, and two radial cells linear and dark including marginal veins. Caudal abdominal segments yellow; in female, sternite 7 with a spinous caudal projection and hemisternite 8 with five long black bristles; male hypopygium with chitinized rod on ventral side, coxite with mesal membranous lobe and style slender and arcuate in ventral aspect but distal one-third dilated vertically.

*Female*: Body length about 1.51 (1.34-1.66) mm. Wing about 0.9 (0.87-0.95) mm. by 0.35 (0.31-0.38) mm.

Head dark brown, with eyes finely pubescent and contiguous above, mouthparts dark brown, proboscis small and conical; clypeus with nine (8 to 12) setae; segment 3 of maxillary palp with a sensory pore just beyond middle, maxillary palp with five segments in proportion of 9:9.5:10.5:7.5:8. Antenna entirely dark brown, basal segments 2 to 9 subspherical, following five elongate; AR about 1.55; distal eight segments in proportion of 7:7:8:16:17:18:17.5:25.

Thorax dark brown; scutum with five pairs of yellow window-like spots and pair of short yellow stripes, these spots with minute brown wrinkle-like structure and arranged as follows: Pair on shoulder parts, two pairs on caudoscuteal area, two pairs along lateral margins, and pair of yellow short stripes on median part of anterior half. Scutellum chestnut brown and darker on marginal area, with two strong bristles on median part, pair of lateral smaller bristles, and several minute accessory setae; other thoracic sclerites all dark brown and pleural membranes yellow. Legs with coxae brown and other segments all yellowish brown; claws with minute, ventral, blunt tooth at middle; leg segments, except for basal two, in proportion of 87.5:91:42.3:14.5:11.8:10:14.5 in fore leg, 108.8:102.5:43.8:15.5:12.3:10.8:14.5 in middle leg and 113.8:96.5:48.5:17.8:14:10.8:14.8 in hind leg.

Wing without macrotrichia on membrane, two radial cells and marginal veins dark brown. Venation: Costa about 0.66 as long as wing (15.1:23) and ending at level of distal one-third of apical margin of cell  $M_4$ , first radial cell about half length of second cell (6.6:11.8) and both radial cells linear, lengths of  $R$ ,  $R_1$ ,  $R_s$ , and stem of  $fMCu$  in proportion of 16.7:8.3:20:27.3,  $r-m$  subequal to  $M_{1+2}$ ,  $fMCu$  under tip of  $R_1$ , angle of  $fMCu$  about 45 degrees,  $Cu_1$  almost straight. Haltere white or yellowish white.

Abdomen with tergites and sternites brown, lateral membranes dark brown, but caudal part yellowish pale brown, sternites 7 and 8 with specific armature; sternite 7 rhombic, yellow, caudomesal part slightly produced and fringed with a row of spines and with many small spinules, about ten (9 to 13) setae arranged in line along caudal margin; sternite 8 widely subdivided into pair of small hemisternites, each of which has tuft of five or six long black bristles on apical margin and two small setae on middle part; broad depressed area between paired hemisternites with pair of groups of three (1 to 4) short and strong spines and with a broad, somewhat U-shape plate.

*Male*: Body about 1.44 (1.26-1.57) mm. long. Wing about 0.96 (0.94-0.98) mm. by 0.31 (0.3-0.31) mm. General structure and coloration closely similar to those of female, with usual sexual differences and following specific characters.

Head: Clypeus with nine or ten small setae; five palpal segments in proportion of 7:9.5:12:8.5:8. Antenna with scape brown, segments 2 to 10 pale brown, distal four segments brown, plumose hairs pale brown; segments 2 to 10 and 11 to 14 in proportion of 90.5:96.8 (AR about 1.07, ranging from 1.05 to 1.1), distal eight segments in proportion of 8.8:8.9:8.8:8.8:23.4:22.8:21.3:30.3.

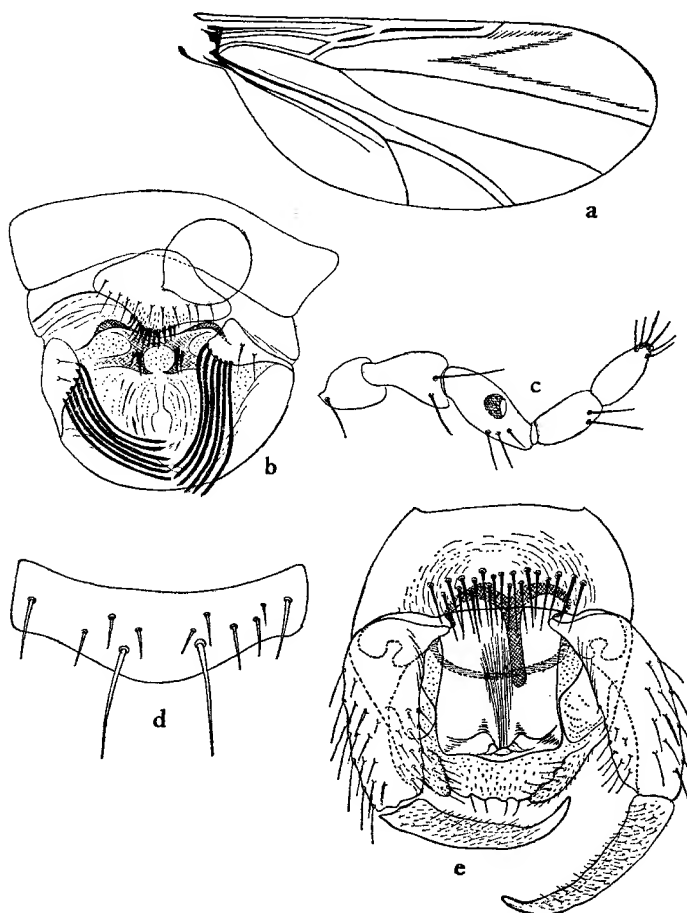


FIGURE 4.—*Atrichopogon fenestriscutum*. a, b, female: a, wing; b, apex of abdomen (ventral aspect). c-e, male; c, maxillary palp; d, scutellum; e, hypopygium.

Thorax: Scutellum with pair of strong median bristles and pair of shorter lateral setae and six to eight minute accessory setae. Legs with claws bifid at tip and each with minute blunt tooth at middle of ventral side; proportion of leg segments from femora about 93.5:98.5:47.5:16:13.5:11.5:16 in fore leg, 111.5:109:48.5:18.5:14.5:12.5:16.5 in middle leg, and 119:100:53:20:15:12:15.6 in hind leg.

Wing with costa reaching to basal 0.6 of wing (44.7:75.3) and ending slightly beyond level of tip of  $Cu_1$ ,  $R_s$  hardly twice as long as  $R_1$ , second radial cell a little longer than first (7:3:6.5),  $R$ ,  $R_1$ ,  $R_s$ , and stem of  $fMCu$  in proportion of 19.7:7.7:14.2:32,  $fMCu$

under second radial cell; two radial cells and marginal veins not dark but brown. Haltere yellowish white.

Abdomen with tergites and sternites brown, lateral membranes dark, segment 9 and hypopygium yellow. Hypopygium with sternite 9 about 2.1 times as wide as long at base and transverse at caudal margin, highly setigerous on caudomesal area with about 18 strong dark-brown bristles; tergite 9 round on caudal margin and reaching apices of coxites. Coxites rather slender, about 2.6 times as long as basal width, each with membranous mesal lobe at sub-basal part, basal root very small and knob-like; styles slender, long, slightly longer than coxites (44:42), distinctly arcuate, tapered, pubescent on basal two-thirds, preapical part vertically expanded and with chitinated ridges. Aedeagus somewhat square, far longer than wide, basal ridge of aedeagus sinking cephalad above sternite 9, then produced caudad forming a long median rod which is dark brown and fully half as long as square aedeagus, basal arch very small and V-shape, square part of aedeagus with expanded shoulders, midventral ridge and three minute tubercles at tip of longitudinal ridge. Parameres represented only by a narrow bridge between ventral basal tips of coxites.

Holotype, female (US 64018), Mt. Temwetemwensekir, 180 m., Ponape, light trap, Jan. 19, 1953, Gressitt. Allotype, male (US), same data as for holotype.

Paratypes:

Palau. Female, Ngiwal, Babelthuap, 1 m., Dec. 16, 1953, Gressitt; female, Ulebseheli, Sept. 1952, Krauss.

Yap. Female (BISHOP), hill behind Yaptown, Yap, 60 m., Nov. 29, 1952, Gressitt; two females (MCZ), Tomil Distr., Gagil-Tomil, July-Aug. 1950, Goss.

Ponape. Three females, five males, Mt. Temwetemwensekir, 180 m., light trap, Jan. 19, 1953, Gressitt; female, Agric. Exper. Sta., Colonia, 16 m., light trap, Jan. 7, 1953, Gressitt; two females, four males, Nanpohnmal, light trap in mountain, Jan. 11, 1953, Gressitt.

Kusaie. Female, Mutunlik, light trap, Mar. 30, 1953, Clarke.

Other specimen, female, Airai, Babelthuap, Palau Is., May 26, 1957, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau, Yap, Ponape, Kusaie).

This species is quite specific in the coloration of the scutum and the structure of the male hypopygium and the female ventral abdominal processes, differing widely from the known species of the genus.

##### 5. *Atrichopogon arciforceps* Tokunaga (fig. 5).

*Atrichopogon arciforceps* Tokunaga, 1941, Annot. Zool. Japon. 20 (2): 110.

Black or dark-brown; eyes entirely finely pubescent; wings with macrotrichia on apical part. In female, abdomen without special ventral processes; in male, last three antennal segments elongate cylindrical, segment 11 only slightly longer than subspherical segment 10 and hypopygium with style very stout, somewhat clavate at tip, and strongly curved sub-basally.

*Male*: Body about 1.4 mm. long.

Head dark brown. Antenna very dark brown; plumose hairs reduced, only on basal segments 3 to 6; segments 3 to 5 spherical; 6 to 9 somewhat discoidal; 10 subspherical; 11 short, oval, and slightly longer than wide; following three elongate and cylindrical; AR about 1.21; proportion of distal eight segments about 7:7:7:9:11:26:28:40.

Thorax dark brown, shining, with setae dark, scutum with a pair of rather broad, yellowish stripes along foveae; scutellum yellowish brown. Fore legs pale brown and other legs brown; leg segments, except for basal two, in proportion of 20:19:10.5:3.5:3:2.3:3.5 in fore leg, and 24:21:10:4:3:2.5:3 in hind leg. Wing with sparse macrotrichia, only on distal one-third of cell  $R_5$  and on distal half of cell  $M_1$ . Second radial cell fully twice as long as first cell (55:25),  $R_s$  about 2.5 times as long as  $R_1$ , costa about 0.7 as long as wing (38:54.5), fMCu under middle of first radial cell, tip of  $Cu_1$  ending slightly beyond tip of  $R_1$ ,  $M_{3+4}$  ending far beyond costal end. Haltere white.

Abdomen with tergites and sternites brown and complete, membranes also brownish. Hypopygium with coxites rather short, about 1.5 times as long as wide (35:25), somewhat oval in ventral aspect; style stout, strongly curved sub-basally, slightly clavate apically, and with one or two minute teeth on preapical edge.

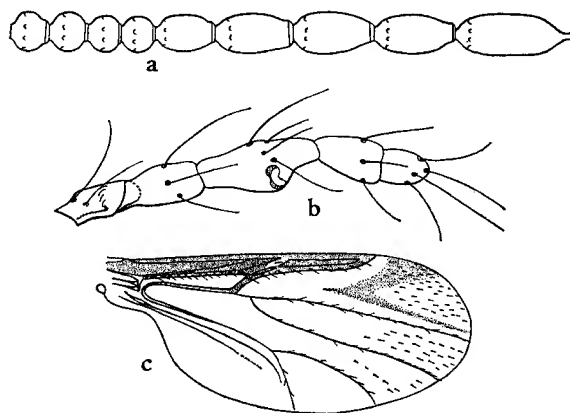


FIGURE 5.—*Atrichopogon arciforceps*, female: a, distal nine antennal segments; b, maxillary palp; c, wing.

*Female*: Body about 1.3-1.73 mm. long and mainly dark brown. Legs mainly yellowish and pale brownish. Wings about 0.86-0.91 mm. by 0.34-0.38 mm. and with macrotrichia very sparsely distributed on apical quarter.

Head dark brown on vertex, frons pale brown, mouthparts brown; eyes entirely pubescent and contiguous above, proboscis about half as long as height of head capsule (16:32); clypeus with about 14 to 17 dark setae. Maxillary palp rather short and stout, with somewhat irregular sensory pore on each third segment, five segments in proportion of 11:14:16:10:7. Antenna entirely brown, basal short segments almost spherical, but very little shorter than wide, distal five segments gradually elongate on distal ones, last segment longest and with distinct terminal stylet; AR about 1.32 (1.28-1.36); relative length of distal eight segments about 6.8:6.8:7:12.8:14:16:16.8:26.3.

Thorax mainly black, with setae black and stiff; scutum with pair of dull yellow and ill-defined stripes on foveae, obscure yellowish clouds on lateral sides covering scutal sutures and yellowish on central part of caudoscuteal area; scutellum with four strong bristles and about five to 12 minute setae. Legs mainly yellowish or pale brown, in fore leg, coxa, trochanter and femur entirely yellow, tibia yellowish brown, tarsal segments pale brown, and in middle and hind legs, coxae yellowish brown, trochanters yellow, femora yellow on basal half and yellowish brown on apical half, tibiae entirely yellowish brown, tarsi pale brown. Hind leg with TR about 2.63 (2.5-2.78) and five or six bristles of tibial comb; relative length of leg segments, except for basal two, about 100:97:54:16:14:13:16 in fore, 115:107:57:18:15:13:16 in middle, and 123:106:56:22:16:13:18 in hind leg.

Wing with veins brownish, costal and two radial cells and intercalary fork brownish, macrotrichia sparsely spread on apical quarter and very few closely along anal margin of cell  $M_4$  and anal cell or absent in these cells; radial veins,  $M_1$ ,  $M_2$ ,  $M_{3+4}$  and  $Cu_1$  with setae. Venation: Costa ending at basal 0.7 of wing length (49.5:70),  $R_s$  about 2.5 times  $R_1$  (22.5:9.5), second radial cell about three times as long as first (14.5:5.5), relative length of  $R$ ,  $M$ , and stem of  $fMCu$  about 19.3:17:27.5,  $r-m$  longer than  $M_{1+2}$ ,  $fMCu$  under tip of first radial cell,  $M_{3+4}$  ending under tip of  $R_s$  and about 1.8 times  $Cu_1$  (19.5:10.5) which ends at level of tip of  $R_1$ . Haltere with stem dark and knob white.

Abdomen with tergites and sternites subsquare, brown, pleural sides fuscous and with fine brownish striation, caudal two segments and cerci yellowish brown or yellow; one spermatheca only, large, black, subspherical (6.5-34.5 by 29.5 units), with slender neck part and hyaline punctures on apical part before neck.

#### DISTRIBUTION: Caroline Is.

PALAU. BABELTHUAP: Ngaremlengui, female, June 1957, Sabrosky; Melekeiok, May 1957, Sabrosky. KOROR: May 1957, Sabrosky.

YAP. RUMUNG: Female, June 1957, Sabrosky. GAGIL-TOMIL: Gagil, June 1957, Sabrosky.

In 1941 Tokunaga reported an unidentified species, *Atrichopogon* (*Kempia*) sp. no. 2, which is thought to be a female of *A. arciforceps*.

#### 6. *Atrichopogon spinicaudalis* Tokunaga, n. sp. (fig. 6).

Rather small, dark-brown; legs yellow, halteres white. Female antenna with basal short flagellar segments subspherical, apical five long segments at least three times as long as basal subspherical ones; in male, segment 11 much shorter than 12; maxillary palp with sensory pore of segment 3 small and just beyond midway of segment. Scutum dark brown, with obscure, yellowish stripes on foveae, pair of distinct, window-like, pale spots on caudoscuteal area just before scutellum, scutellum with two strong median bristles and few small setae. Legs with hind TR about 2.35 in female and 2.44 in male. Wings without macrotrichia on membrane. Abdomen of female with caudal end yellowish; sternite of penultimate segment with three thorn-like spines on lateral part of caudal margin, ultimate segment with pair of groups of about 20 thorn-like spines; single spermatheca, rather small, oval, and with hyaline minute punctures on basal part. Male hypopygium mainly yellow and styles and aedeagus brown; aedeagus broad and style rather slender and simple.

*Female*: Body about 1.23 mm. long. General color dark brown, but legs mainly yellow and halteres white.

Head dark brown, with eyes entirely pubescent and contiguous above, proboscis little shorter than half of length of head capsule (8.5:20.5); clypeus with three to five marginal setae on either side and several (5 or 6) median setae on dorsal half. Maxillary palp with sensory pore of segment 3 small, beyond midway of segment and few sensillae in the pore; relative length of five segments about 8:10:16:7.5:7.8. Antenna also dark brown, with basal short flagellar segments very short and spherical, apical five segments cylindrical and last three times as long as basal spherical segments; AR about 2.14 (2.0-2.28); distal eight segments about 7:6.8:7:22:22.4:22.8:24.3:31.4 in relative length.

Thorax almost entirely dark brown, but scutum with pair of obvious, small, window-like, pale spots on caudoscuteal area just before scutellum, pair of obscure, median, yellowish stripes on foveae and ill-defined, yellowish cloud on either lateral side covering scutal suture; scutellum with two strong median bristles and three or four small accessory setae. Legs extensively yellow, but distal two tarsal segments slightly fuscous; relative length of leg segments, except coxae and trochanters, about 79:79.5:41.5:14.3:12:10:13.5 in fore, 95:96:45:15.5:13:10.5:13.5 in middle, and 102.5:93.5:47:20:15.5:11.5:13 in hind leg; hind leg with TR about 2.35 (2.32-2.38) and six bristles of tibial comb.

Wing almost uniformly pale brown, but costal and two radial cells more brownish, without macrotrichia on membrane,  $R_s$  with only four setae. Venation: Costa ending at

basal 0.7 of wing length (45.5:65.5),  $R_1$  very short, about one-third as long as  $R_s$  (8:23.5), first radial cell very narrow and slit-like, second radial cell narrow, long and about 2.5 times as long as first cell (15.5:6.5), proportional length of R, M, and stem of fMCu about 16:14.3:24, fMCu under end of first radial cell,  $M_{1+2}$  as long as r-m,  $M_{3+4}$  about twice as long as  $Cu_1$  (20:9.5) and ending at level of costal end. Haltere entirely white.

Abdomen slightly fuscous brown with tergites subsquare, sternites highly reduced, caudal two segments and their appendages yellow, penultimate sternite with three thorn-like spines on either side of caudal margin, ultimate sternite with pair of spinous groups consisting of about 20 thorn-like spines. Single spermatheca, oval, rather small (28.3 by

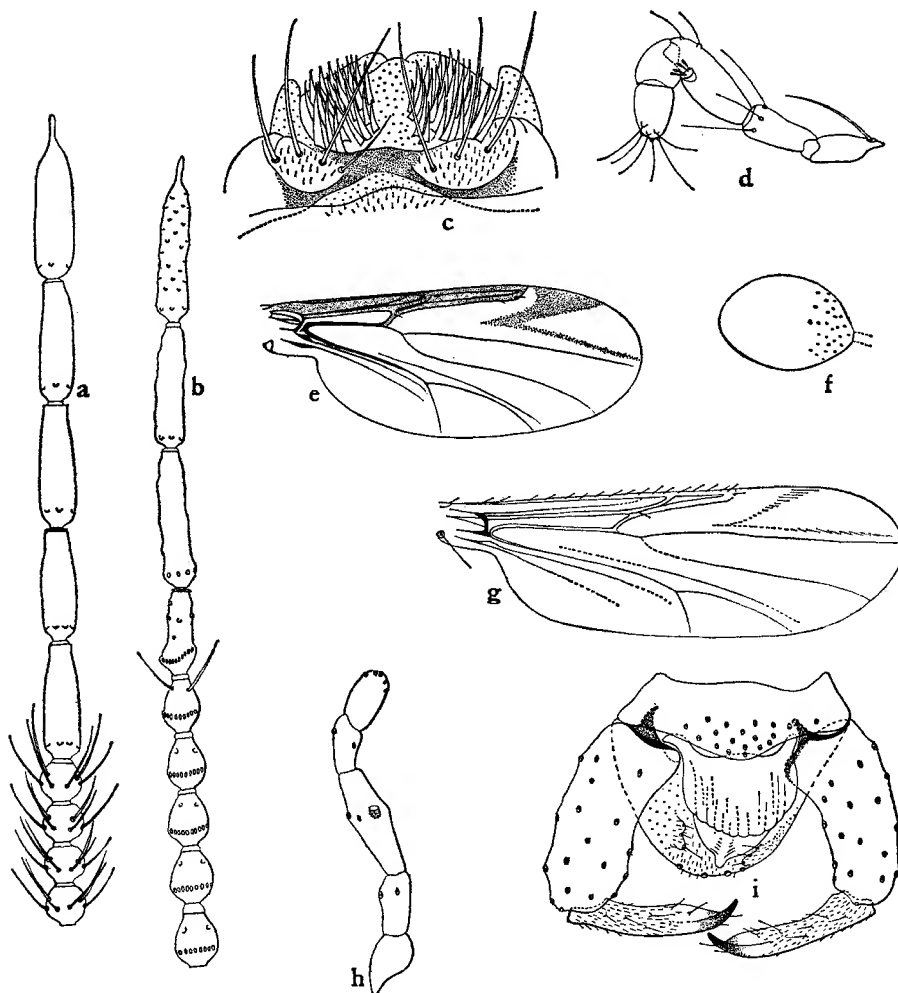


FIGURE 6.—*Atrichopogon spinicaudalis*. a, distal nine antennal segments, female; b, distal nine flagellar antennal segments, male. c-f, female: c, apex of abdomen; d, maxillary palp; e, wing; f, spermatheca. g-i, male: g, wing; h, maxillary palp; i, hypopygium.

19.3 units), brown, with minute hyaline punctures on basal part and without chitinized neck part.

*Male*: Body length about 1.24 mm. Wings about 0.92 mm. by 0.29 mm. Coloration similar in female being dark and yellow.

Head entirely dark brown, with eyes entirely pubescent and just contiguous above, proboscis short and far shorter than half of head capsule (9:23.3); clypeus with about 12 setae. Maxillary palp slender, segment 3 with very small, sensory pore more or less beyond middle, five segments in proportion of 6.8:8.7:16:7:7.3. Antenna entirely dark, total length of apical four segments together little shorter than that of basal segments 2 to 10 together (90:98.2), segment 11 about 1.5 times 10 and about two-thirds as long as 12, last segment longest and with slender terminal stylet, distal eight segments in proportion of 10:10:9.8:9.5:14.7:22.7:22.5:29.8.

Thorax almost entirely dark, caudoscuteal area with pair of hyaline spots on lateral parts just before scutellum at ends of slender, yellowish, paler stripes on foveae; scutellum with two median strong bristles, two smaller lateral setae and usually a pair of minute hairs. Legs with coxae yellowish brown, ultimate two tarsal segments browner, other segments all yellow; claws slightly bifid only at tips, tibial comb of hind leg with six or rarely seven apical bristles; hind TR about 2.44, from 2.42 to 2.45; relative length of leg segments, except for basal two, about 79.3:78:45:14:12.3:10:12.3 in fore, 97.7:95.7:48.3:15.2:13.2:10.2:12.3 in middle, and 107.3:97:49.7:20.3:16.3:11.3:13.7 in hind leg.

Wing without macrotrichia on membranes, with veins pale brownish fuscous. Venation: Costa ending far beyond middle of wing (42.7:70.7) and at level of midway between tips of  $M_{3+4}$  and  $Cu_1$ , relative length of R, M, and stem of fMCu about 19.7:17:29.7, Rs about twice of  $R_1$  (15.7:8.3), first radial cell slit-like, second radial cell very narrow and little longer than first (7.7:6.7), r-m subequal to or little longer than  $M_{1+2}$ , fMCu under tip of  $R_1$ ,  $M_{3+4}$  about 2.4 times as long as  $Cu_1$  (18.3:7.7). Haltere with knob white and stem brown.

Abdomen fuscous, with sternites reduced, tergites subsquare. Hypopygium mainly brown, but coxites, tergite 9 and sternite 9 yellow; sternite transverse, very short, round on caudal margin, and with about 15 bristles on middle part; tergite little wider than long (39:34.7) and round on caudal margin; coxites slender, about 2.4 times basal width (33.4:14) and cylindrical; styles beak-like, with flattened edge on flexor side and much shorter than coxites (27.3:33.4); aedeagus very broad, round, with apical membranous hyaline lobe.

Holotype, female (US 64586), Ngaremlengui, Babelthuap I., Palau, light trap, June 3, 1957, Sabrosky. Allotype, male (US), with holotype. Paratypes, female, nine males (BISHOP), Palau, with types.

DISTRIBUTION: Caroline Is. (Palau).

This species is closely similar to Micronesian *A. arciforceps* Tokunaga, but in the female of the allied species, the distal long segments of the antennae are elongate-oval and shorter than three times the length of the basal short segments and the spermatheca is far larger, spherical, without minute hyaline punctures, but with a rather long chitinized neck part, obviously differing from the new species and, in the male of *arciforceps*, the styles are strongly arcuate on basal parts and somewhat swollen apically, greatly differing from *spinicaudalis*.

#### 7. *Atrichopogon armaticaudalis* Tokunaga and Murachi, n. sp. (fig. 7).

Small dark-brown to yellowish-brown; eyes pubescent, scutum highly pruinose, wings of both sexes without macrotrichia on membrane, legs mainly yellow, abdomen brown but

in female, posterior three segments, including genital appendages, yellow. Female with peculiar ventral processes on abdominal segments 7 and 8.

*Female*: Body length about 1.77 (1.56-1.96) mm. Wing about 1.13 (1.11-1.15) mm. by 0.44 mm.

Head brown, with eyes broadly contiguous above and minute pubescence; clypeus with several pairs of small setae; proboscis about half as long as height of head. Maxillary palp rather short, segment 3 with sensory pore slightly beyond middle, five segments in proportion of 11.6:10.4:15.4:9.2:11.6. Antenna with scape yellowish brown and other segments brown, segments 2 to 9 subspherical, those of 10 to 14 cylindrical; AR about 1.63 (1.49-1.77); distal eight flagellar segments in proportion of 8.6:8.8:9.3:19.5:21.8:23.3:25.5:35.8.

Thorax mainly brown, but in dry state scutum highly pruinose and pale gray along longitudinal foveae, in mounted state scutum with ground coloration brown to dark brown

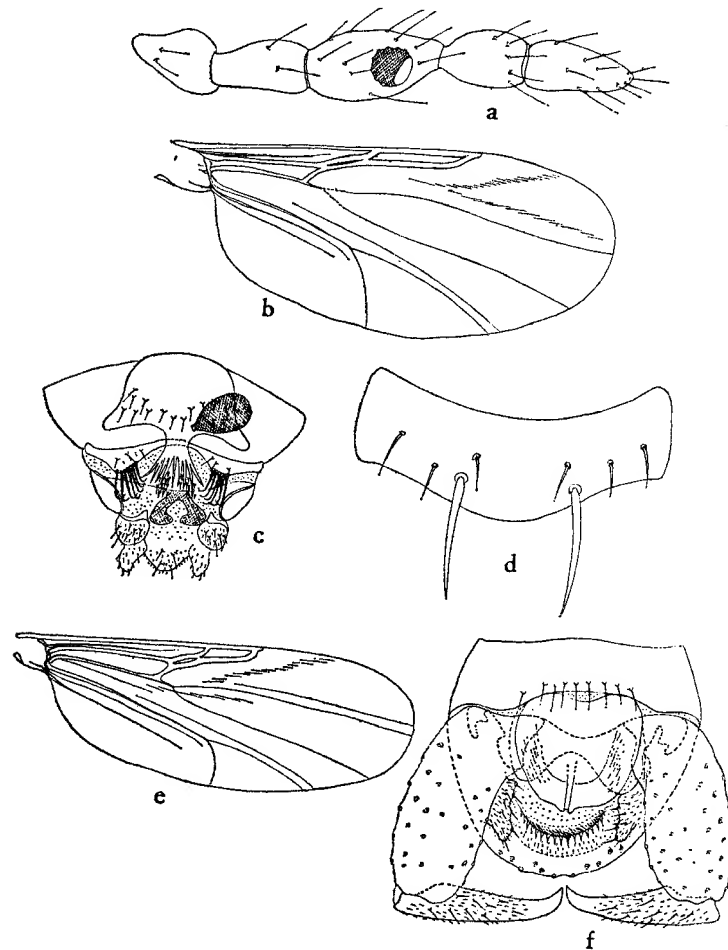


FIGURE 7.—*Atrichopogon armaticaudalis*. a-c, female: a, maxillary palp; b, wing; c, apex of abdomen (ventral aspect). d-f, male: d, scutellum; e, wing; f, hypopygium.



and with pair of yellow-brown stripes along foveae. In paler specimens, paired stripes yellow, median vitta dark brown, lateral areas yellowish pale brown, and lateral margins dark brown; in darker specimens, scutum extensively dark brown, median vitta black, paired stripes along foveae yellowish pale brown, and shoulder parts yellowish. Scutellum yellowish brown, with pair of strong bristles at middle and seven or eight small setae; postscutellum dark brown or black; pleural and sternal sclerites dark brown or brown and pleural membranous areas yellow. Legs with coxae brown and other segments yellow; leg segments, except for coxae and trochanters, in proportion of 106:103.5:55.3:18.5:15.6:11.8:14.5 in fore leg, 129.8:134.9:66.5:19.8:16.5:13.5:15.8 in middle leg, and 141:120:72.5:23:18.5:14.1:16.8 in hind leg.

Wing oval, with veins pale brown, without macrotrichia on membrane. Venation: Costa almost three-fourths of wing (59.3:85.6), produced little beyond tip of Rs and ending slightly before level of tip of  $M_{3+4}$ , second radial cell very narrow and 2.5 times as long as first cell (19.3:7.5), Rs about three times as long as  $R_1$ , relative length of veins R,  $R_1$ , Rs, and stem of fMCu about 20.7:9:27.6:31.8, cross vein r-m subequal to  $M_{1+2}$ , fMCu under tip of  $R_1$ , angle of fMCu less than 45 degrees. Haltere with stem pale brown and knob yellowish pale brown or pale brown.

Abdomen with tergites brown, sternites brown or pale brown, pleural membranes fuscous or dark, but four caudal segments yellow. Sternites 7 and 8 with peculiar processes; sternite 7 yellow, inverted trapezoid, with many setae on caudal half and median caudal appendage consisting of short broad stem and six to ten apical spines arranged palmately. Sternite 8 subdivided into two very short subtriangular plates, each provided with tuft of strong bristles consisting of six or seven apically recurved yellow bristles arranged on apical margin, with three small setae along mesal margin, and sometimes with one or two short stout spines on mesal margin. Membranous area between hemisternites of sternite 8 with pair of groups of short spines on anterior part and a Y-shape thin plate on caudal part. Spermatheca single, large, oval, about 28.7 by 16.3 units, dark brown, without chitinized duct.

*Male:* Body length about 1.48 mm. Wing about 1.08 mm. by 0.34 mm. Coloration and structure generally similar to those of female with usual sexual differences and special sexual modification of abdominal tip.

Head dark brown, with eyes broadly contiguous above and very finely pubescent; clypeus with about seven pairs of short setae; proboscis about half as long as height of head capsule. Maxillary palp with five segments in proportion of 9:8.8:12.5:8:10. Antenna with scape yellow, segments 2 to 10 very pale brown, segments 11 to 14 brown, plumose hairs yellowish pale brown or pale brown, distal eight segments in proportion of 12:12:12:12.6:29:27.4:25.8:34.5; proportion of segments 2 to 10 and 11 to 14 about 115.2:116.6; AR about 1.01, from 0.95 to 1.06.

Thorax generally dark brown; scutum with three dark-brown vittae, of which median vitta is sometimes black and lateral vittae are sometimes brown, paler than median, and with yellowish longitudinal stripes on foveae and yellowish caudoscuteal area. Scutellum with pair of strong bristles and three pairs of small setae. Legs with coxae brown or dark brown, other segments much paler, yellowish or pale brown; claws somewhat thickened at middle and simple; leg segments, except for basal two, in proportion of 104.6:101.2:57.6:16.4:14:11.4:15.2 in fore leg, 125.6:129.6:63.6:19.6:15.6:12.6:14.7 in middle leg, and 132:112.8:67.8:21:17.8:13.8:16.6 in hind leg.

Wing with following venation: Costa extending little longer than three-fifths of wing (16:25), Rs longer than twice of  $R_1$ , second radial cell slightly shorter than twice of first cell (11.5:6.8), length of R,  $R_1$ , Rs, and stem of fMCu in proportion of 23.3:8.5:19:35.3, fMCu just beyond tip of  $R_1$ , rarely under tip of  $R_1$ , costal end at level of midway of caudal margin of cell  $M_4$ , angle of fMCu about 60 degrees, and  $Cu_1$  strongly curved to anal margin of wing at about 90 degree angle.

Abdomen with sternites and tergites pale brown, lateral membranes fuscous. Hypopygium brown, with style yellow; sternite 9 about four times as broad as long at base, without caudal excavation, with about nine setae along caudomesal margin. Tergite 9 rounded, not exceeding tip of coxites; coxites about 2.5 times as long as basal width, bases

of coxites produced mesad compressing aedeagal base, basal root of coxite short, stout, and with two small processes; styles about 0.8 as long as coxites and about 4.7 times as long as basal width, greatly tapered, with apices pointed and strongly incurved, almost entirely pubescent except for apical one-fifth. Aedeagus as broad as long, basal arch very obscure, basal arms practically absent, base of aedeagus expanded backward, almost reaching sternite 9, posterior margin round, with slightly expanded shoulders and two minute processes at tip. Parameres hidden behind aedeagus, deeply constricted at middle, each lateral half divergent and round at tip.

Holotype, female (US 64019), Mwot, Kusaie, Apr. 10, 1953, Clarke. Allotype, male (US), Ngarmalk I., near Ulebsehel, Palau, 25 m., Dec. 12, 1952, Gressitt.

Paratypes:

Guam. Male, Potts Junction, Oct. 1952, Krauss.

Palau. Three females (BISHOP), Ngaiangl I., Ngaiangl Atoll, light trap, Dec. 15, 1952, Gressitt; female, east Ngatpang, Babelthuap, 1 m., Dec. 10, 1952, Gressitt; three females, Ngiwal, Babelthuap, 1 m., light trap, Aug. 15, 1951, Dec. 16, 1952, Gressitt; ten females, Ngaremeskang, Babelthuap, 25-30 m., light trap, Dec. 20, 24, 1952, Gressitt; female, Ulimang, Babelthuap, Dec. 26, 1947, Dybas; female (CM), Koror, Jan. 1948, Dybas; two females, Koror, at light, Sept. 16, 1952, Beardsley; male, Koror, at light, Apr. 1-2, 1953, Beardsley; 21 females, male, southwest Koror, 25 m., light trap, Dec. 5, 11, 12, 14, 1952, Gressitt; female, Mt. Amiangal, Peleliu, light trap, Dec. 22, 1952, Gressitt; female, Ulebsehel, Sept. 1952, Krauss; female, four males, northwest Ulebsehel, 25 m., Dec. 12, 1952, Gressitt.

Yap. Female (MCZ), north Yap I., July 16, 1950, Goss; two females, south Yap I., July-Aug. 1950, Goss; female, Oct. 1952, Krauss; female, hill behind Yaptown, 60 m., light trap, Nov. 29, 1952, Gressitt; female, Gagil Distr., Gagil-Tomil, July 20, 1950, Goss.

Caroline Atolls. Female, Pis I., Losap Atoll, Oct. 31, 1952, Beardsley.

Ponape. Female, south of Nanpohnmal, Jan. 17, 1953, Clarke.

Kusaie. Forty-seven females, ten males (BISHOP, CM), Mutunlik, 16 m., Jan. 23, 24, 1953, Gressitt; five females, Mutunlik, 22 m., Jan. 26, 30, 1953, Clarke; 34 females, Pukusrik, 1 m., light trap, Feb. 13, Apr. 2, 3, 1953, Clarke; female, Mt. Matante, 380 m., Feb. 11, 1953, Clarke; 61 females, eight males, Mutunlik, Jan. 31, Feb. 8, Mar. 30, 1953, Clarke; 164 females, ten males, Mwot, Apr. 10, 1953, Clarke; eight females, three males, Hill 1010, 300 m., light trap, Apr. 13, 1953, Clarke; female, Malem, 90 m., Apr. 27, 1953, Clarke.

Other specimens:

Palau. 44 females, 14 males, Ulimang, Babelthuap, Dec. 10-19, 1947, Dybas; four females, six males, Ngaremlengui, Babelthuap, June 1-4, 1957, Sabrosky; female, Koror, Nov. 20-30, 1947, five females, male, Dec. 2, 1947, Dybas; male, Apr. 28, 1957, Sabrosky; male, Peleliu, May 28, 1957, Sabrosky.

Yap. Male, Dugor District, Yap, June 1957, Sabrosky; female, male, Tomil District, Yap, July 8, 1950, Goss.

Caroline Atolls. Three females, Nama, Feb. 15-16, 1949, Potts.

Ponape. Male, Mt. Kupwuriso, at north slope, Mar. 11, 1948, Dybas.

Kusaie. Four females, Pukusrik, in mangrove swamp, Apr. 2, 1953, Clarke; female, Apr. 3, 1953, Clarke; seven males, Mt. Matante, 580 m., Feb. 20, 1953, Clarke; four females, two males, Mutunlik, Feb. 3-19, 1953, Clarke; female, Mar. 3, 1953, Clarke; six females, male, Hill 541, 165 m., Mar. 11, 1953, Clarke; 25 females, two males, Mwot, at light, Apr. 10, 1953, Clarke.

DISTRIBUTION: Mariana Is. (Guam), Caroline Is. (Palau, Yap, Truk, Ponape, Kusaie).

*A. armaticaudalis* is rather widely distributed in the western islands of Micronesia. It is somewhat related to *A. armativentris* Kieffer and *A. harpagonum* Macfie; but in *A. armativentris*, the female is provided with a racket-shaped process on sternite 7 and in *A. harpagonum*, the eighth female hemisternites are provided with a pair of strong hooks, greatly differing from the females of *A. armaticaudalis*.

#### 8. *Atrichopogon flavenicruris* Tokunaga and Murachi, n. sp. (fig. 8).

Minute dark-brown; eyes finely pubescent; wing without macrotrichia on membrane; haltere dark brown. Female without special processes on ventral side of abdominal end. Male hypopygium simple.

*Female*: Body length about 1.18-1.3 mm. Wings about 0.9-1.0 mm. by 0.36 mm.

Head dark brown, with mouthparts brown and proboscis about one-third as long as height of head capsule; clypeus with about four pairs of small setae. Eyes broadly contiguous above, finely pubescent with minute hairs about half as long as diameter of facets, dorsal parts of eyes more densely pubescent than on ventral parts. Maxillary palp short, segment 3 oval, about twice as long as wide, with sensory pore before distal end, with five segments in proportion of 7:9:11:7:7. Antennae broken.

Thorax almost uniformly dark brown; scutellum with four strong bristles, pair of similar lateral bristles, and one or two minute setae between above mentioned two pairs. Legs with coxae brown, other segments yellowish; proportion of segments, except for basal two, about 93.5:94:53.5:15:13.5:11: ? in fore leg, 109:110.5:60:17:13:12: ? in middle leg and 117.5:105.5:60:20:15:12: ? in hind leg; hind TR about 2.88; tibial comb of hind leg with seven or eight strong bristles.

Wing without macrotrichia on membrane, two radial cells very narrow, but distinct and dark brown, including marginal veins. Venation: Costa ending at about five-sevenths of wing (50.5:69) and very slightly produced beyond end of Rs, distinctly beyond level of tip of  $M_{3+4}$ ; relative length of R,  $R_1$ , Rs, and stem of fMCu about 20.5:6:21.5:26, R subequal in length to Rs, Rs about 3.5 (3-4) times as long as  $R_1$ , second radial cell about three times as long as first (16:5), cross vein r-m longer than  $M_{1+2}$ , fMCu under midway of first radial cell, tip of  $Cu_1$  at level of tip of  $R_1$ , tip of Rs slightly beyond tip of  $M_{3+4}$ , angle of fMCu less than 60 degrees, but  $Cu_1$  ending at wing margin with 90 degree angle. Haltere brown.

Abdomen with caudal segments not yellow, but brown as in other segments; spermatheca dark brown, single, short-oval (1+17 by 13.5 units), with pale-brown, minute neck part, and without distinctly sclerotized duct.

*Male*: Body length about 1.26 mm. Wing about 0.9 mm. long. Coloration closely similar to that of female. Segments of maxillary palp in proportion of 7:7.5:10:6:6. Leg

segments in proportion of 90:90:53:15:?:?:? in fore leg, 100:98:60:16:15:12:?:? in middle leg, and 110:100:60:21:16:13:?:? in hind leg; TR of hind leg about 2.88 (2.8-2.95); tibial comb of hind leg with six apical bristles.

Wing without macrotrichia on membrane as in female. Venation: Costa extending two-thirds of wing, relative length of R, R<sub>1</sub>, R<sub>s</sub>, and stem of fMCu about 23:5:15.5:27.5, fMCu under middle of first radial cell, second radial cell about twice as long as first cell. Haltere fuscous brown. Hypopygium dark brown; sternite 9 about three or more times as broad as long at base, with broad, shallow posterior excavation, with nine setae on caudal area, membrane between aedeagus and sternite 9 very finely spinulose. Tergite 9 exceeding coxites by nearly half their length and round; coxites about 2.2 times as broad

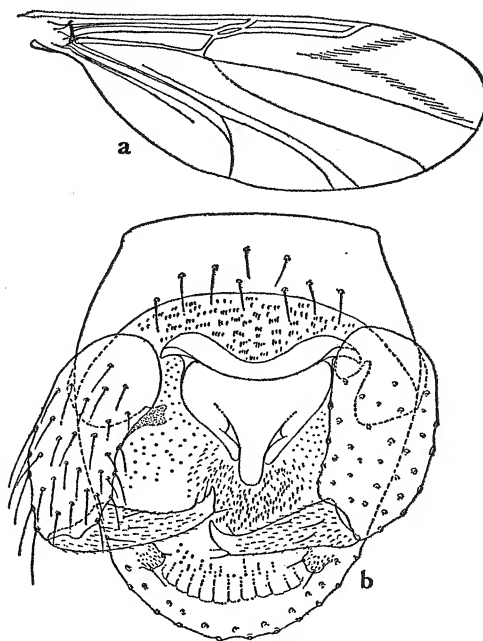


FIGURE 8.—*Atrichopogon flavenicruris*: a, wing, female; b, hypopygium, male.

as long, basal root rather short and slightly dilated at end; styles a little shorter than coxites (45:55), greatly tapered, with apices pointed and distinctly incurved, almost entirely pubescent except for incurved apices. Aedeagus somewhat triangular, basal arms short, stout, directed laterad and with apices pointed, anterior arch very low and broad, caudal tip round, prominent; parameres highly reduced, practically absent. Other structures closely similar to those in female.

Holotype, female (US 64020), Nanpohnmal, Ponape, light trap, Jan. 11, 1953, Gressitt. Allotype, male (US), same data as for holotype. Paratypes, three females, four males (BISHOP), same data as for holotype.

DISTRIBUTION: Eastern Caroline Is. (Ponape).

This species is somewhat allied to *A. arciforceps* Tokunaga, but in that species the male wings are provided with sparse macrotrichia on distal area

and the styles of the male hypopygium are distinctly bent at the sub-basal parts and expanded at the tip. This species name is related to the distinct yellow legs in contrast to the dark-brown body.

## 9. *Atrichopogon gressitti* Tokunaga, n. sp. (fig. 9).

Small dark-brown and yellow; basal flagellar segments of male antenna yellow, legs entirely yellow, hypopygium yellow. Scutum entirely dark brown, without window-like pale spots, scutellum with four strong bristles. Hind TR about 3.0 (2.9-3.1); claws of male stout, with tips bifid and each with a stout median tooth on lateral side. Male hypopygium simple.

*Male:* Body length about 1.2 mm. Wings about 0.9 mm, by 0.29 mm. Head dark brown, with eyes pubescent only on lateral dorsal sides and broadly contiguous above, proboscis yellow and about half of length of head capsule (10.5:22).

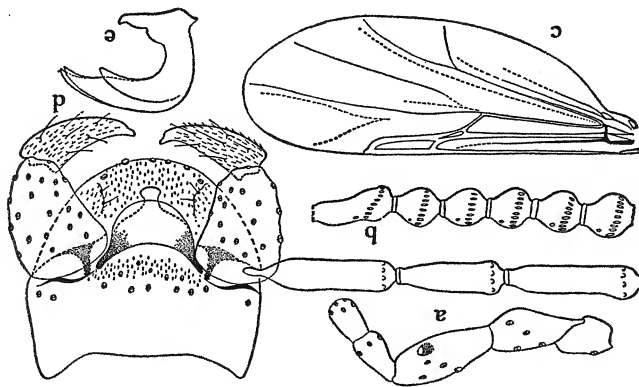


FIGURE 9.—*Atrichopogon gressitti*, male: a, maxillary palp; b, distal nine antennal segments; c, wing; d, hypopygium; e, tarsal claw.

clypeus with about ten setae. Maxillary palp rather slender, pale brown, segment 3 fusiform and with sensory pore at middle or just beyond middle, with five segments in proportion of 7:10:12:7.5:7. Antenna with scape dark brown, basal flagellar segments 2 to 10 yellow including plumose hairs, distal four segments brown, segment 11 about 1.6 to 2.0 times as long as 10 and about 0.5 or 0.6 of 12, relative length of distal eight segments about 9.3:8.9:8.5:8.3:14.5:26:22.8:30.

Thorax entirely dark brown, including sternal and pleural sides; scutellum with four strong bristles and sometimes with two accessory minute setae. Legs entirely yellow, including coxae; TR of hind leg about 3.0 (2.9-3.1), tibial comb of hind leg with five or six apical bristles; claws stout, bifid apically and each with blunt but distinct middle tooth on lateral side; empodia normal. Leg segments, except for basal two, in proportion of about 90.5:86.5:46.5:13.3:11.3:10.5:11.8 in fore, 103.5:97.5:51:15:12.8:10:11.5 in middle, and 110:95.5:57:19:14.5:12:12.5 in hind leg.

Wing rather slender, with main veins pale brown, without macrotrichia on membrane. Venation: Costa little or not produced beyond tip of Rs, extending little beyond two-thirds of wing length (48:69.5) and ending far before tip of  $M_{2+4}$ , R, M and stem of MCu about 24:21.8:30 in proportion, Rs about three times  $R_1$  (17:6), second radial cell little longer than twice length of first (11:4.5),  $M_{2+4}$  far longer than twice of  $Cu_1$  (16.5:7.3), MCu under tip of  $R_1$ ,  $M_{2+4}$  and  $Cu_1$  rather strongly curved. Haltere entirely pale yellow.

Abdomen fuscous pale brown, with hypopygium yellow. Hypopygium simple; sternite 9 transverse, about half as long as total length of hypopygium (15:32), setigerous with about 13 strong setae on caudal median part and caudal membrane spinulose on anterior part; tergite 9 round on caudal margin and without anal points, cerci obscure; coxites conical and about 1.5 times as long as basal width (21:14); styles rather stout, distinctly tapered, slightly curved on apical parts and much shorter than coxites (17:21); aedeagus simple and broad.

*Female:* Unknown.

Holotype, male (US 64587), Yap, Hill behind Yaptown, Yap I., light trap, Nov. 28, 1952, Gressitt. Paratype, male (US), near Yaptown, Yap I., July 14, 1946, Townes.

DISTRIBUTION: Caroline Is. (Yap).

This is closely allied to *A. flavenicruris*. In the allied species, however, the hypopygium and halteres are entirely brown, differing from yellow in the new species and segment 3 of the maxillary palp is distinctly short-oval and provided with a sensory pore on the preapical part, differing from the rather slender segment 3 of the present species which bears a sensory pore at the middle or just beyond the middle.

#### 10. *Atrichopogon brevicornis* Tokunaga, n. sp. (fig. 10).

Small, brown; legs yellow. Eyes partially pubescent. Male antennae with only ten segments. Scutellum with four bristles. Wing without macrotrichia on membrane. Male hypopygium without anal points, caudal membrane of sternite 9 little spinulose on anterior part, styles very small.

*Male:* Body about 1.02 (0.88-1.14) mm. long. Wing about 0.64 (0.58-0.68) mm. by 0.23 (0.22-0.23) mm. Coloration generally brown.

Head dark brown or brown, with mouthparts yellow or very paler, eyes entirely pubescent and contiguous above, proboscis about one-third as long as head capsule, clypeus with seven or eight setae. Maxillary palp with segment 3 longest and oval, sensory pore small but rather deep, five segments in proportion of 5.5:6.7:9.5:6.8:5.7. Antenna ten-segmented, with scape brown, other segments entirely pale brown, basal short segments reduced in number being only six (ten in normal case), but their structure normal, segment 7 about twice as long as 6 (13:6.3) and half as long as 8 (13:28.2), combined length of segments 2 to 7 and 8 to 10 about 53.7:97 and those of segments 2 to 6 and 7 to 10 about 41.7:110.3, relative length of all flagellar segments about 13:8:7.7:6.7:6.3:13:28.2:27.3:38.8.

Thorax entirely brown, without paler or yellowish spots, scutellum with four strong bristles and usually two small setae which are sometimes absent. Legs entirely yellow, hind TR about 2.64 (2.5-2.73), leg segments, except for basal two, about 78.7:76.7:40.7:13:11.5:11.3:14.7 in fore, 85.7:84.7:41.3:13.3:12.2:11.2:14.7 in middle, and 93:81:42.3:16:13.7:10.8:16.2 in hind leg in proportional length; claws bifid only at extreme tips and minute hyaline tooth at middle, hind tibial comb with four or five apical bristles.

Wing without macrotrichia on membrane, veins pale brown and almost devoid of setae. Venation: Costa ending above apical one-third of anal margin of cell  $M_4$  and at basal 0.6 of wing length (35:59.3),  $R_s$  about 2.7 times as long as  $R_1$  (12.2:4.5) and with only two setae, second radial cell narrow, elongate and about three times as long as first (8.8:2.8), relative length of  $R$ ,  $M$ , and stem of  $fMCu$  about 16.3:15.3:21.3,  $M_{3+4}$  little deflected from its stem and about 2.5 times as long as  $Cu_1$  (8.8:2.8),  $fMCu$  just before level of tip of first radial cell and its inner angle about 50 degrees,  $Cu_1$  almost straight. Haltere entirely white or pale yellow.

Abdomen pale brown; hypopygium brown, with tergite 9 semicircular and devoid of anal points, sternite 9 with several setae on median part, without distinct caudal emargination, its caudal membrane sparsely spinulose on anterior part; coxites oval, as long as tergite, styles small, about two-thirds of coxites (14.2:21.7), tapered and very slightly arcuate; aedeagus broad, with basal arch semicircular and one-third as long as total length (5.7:17.8), median ventral swelling round on caudal margin, caudal lobe small, slightly clavate and ending far before level of tips of coxites, no parameres.

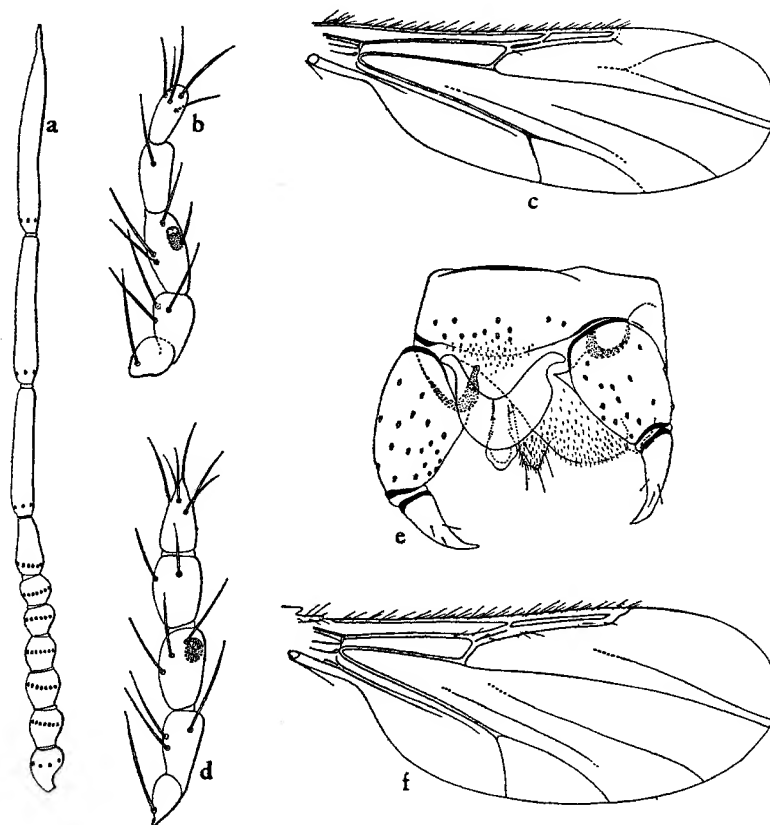


FIGURE 10.—*Atrichopogon brevicornis*. a-c, male: a, flagellar segments of antenna; b, maxillary palp; c, wing. d, maxillary palp, female; e, hypopygium, male; f, wing, female.

*Female*: Body length about 1.24 mm. Wings about 0.75 mm. by 0.27 mm. Coloration and structure similar to those of male with usual sexual difference.

Head pale brown, with eyes pubescent only on lateral dorsal sides and widely contiguous above, mouthparts yellow, proboscis about a quarter of height of head. Maxillary palp stout, with five segments in proportion of 7:7:8:7:6, segment 3 with sensory pore just before tip. Antennae missing.

Thorax similar to male. Legs with claws similar to those of male, main distal seven segments in proportion of 76:74:34:12:12:11:16 in fore, 87:82:38:12:11:10:16 in middle, and 93:80:40:15:12:11:14 in hind leg; hind TR about 2.6; hind tibial comb with five or six apical bristles.

Wing with veins brown, no macrotrichia on membrane, radial veins with very few setae. Venation: Costa little produced beyond tip of  $R_s$ , ending at basal 0.7 of wing length (38:55.5) and somewhat beyond level of tip of  $M_{3+4}$ ,  $R_s$  about 3.6 times as long as  $R_1$ , second radial cell long, very narrow, about four times as long as slit-like first cell (12:3.5), relative length of  $R$ ,  $M$ , and stem of  $fMCu$  about 15.5:14:21,  $fMCu$  under tip of  $R_1$ ,  $M_{3+4}$  not deflected from its stem and about twice of  $Cu_1$  (15:7), angle of  $fMCu$  about 50 degrees and somewhat obliquely meeting anal margin. Haltere white.

Abdomen with tergites pale brown, sternites very pale, cerci white, caudal segments not yellow, without caudoventral armature; spermathecae obscure.

Holotype, male (US 64588), Ngaremlengui, Babelthup I., Palau, June 1, 1957, Sabrosky. Allotype, female (US), with holotype. Paratypes, two males with types and male (BISHOP), at same place, light trap, June 3, 1957, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau).

The male of the present species is highly characteristic in possession of a ten-segmented antenna. The female is somewhat similar to New Zealand *A. fitzroyi* Macfie in possessing indistinguishable spermathecae, but in the allied species, the thoracic scutellum has many (about 12) small setae beside the four usual bristles, the wings have macrotrichia on apical parts, the legs are more or less banded, and the hind TR is about 2.2, distinctly differing from the female of the present species. The second allied species may be *A. obscuripes* Macfie of Society Islands in the features of the female. In this allied species, however, the female wings have numerous macrotrichia in cells  $R_5$  and  $M_1$ , the hind TR is about 3.0, and the spermatheca is single and well chitinized, differing from the female of the present species. The third allied species is *A. sumatrae* Macfie from Sumatra and Malaya, in which the eyes are entirely hairy, the female wings have a few macrotrichia in cell  $R_5$  and  $M_1$  and along the distal part of  $M_1$ , and the spermatheca is single and well developed, differing from the present species.

### Genus *Forcipomyia* Meigen (1818)

*Labidomyia* Stephens (1829), *Tetraphora* Philippi (1865), *Prohelea* Kieffer (1912), *Centrorhynchus* Lutz (1913), *Euforcipomyia* Malloch (1915), *Lepidohelea* Kieffer (1917), *Microhelea* Kieffer (1917), *Ceratopogon* Kieffer (1917), *Apelma* Kieffer (1917), *Trichohhelea* Goetghebuer (1920), *Lasiohelea* Kieffer (1921), *Thyridomyia* Saunders (1925), *Pterobosca* Macfie (1932), and *Phasmidohelea* Mayer (1937).

Body short and stout in female, long and slender in male, and both sexes very hairy. Eyes usually bare. Antenna 14-segmented; in female all segments with ring of rather short verticils at basal part, segments 2 to 9 short and pyriform, vasiform or discoidal, and segments 10 to 14 long and more or less cylindrical; in male segments 3 to 11 each with ring of very long plumose hairs, segments 2 to 10 short and somewhat top-like, segments 11 to 14 long, cylindrical, and basally swollen, segment 11 generally very long; in female of subgenus *Pterobosca* distal six or rarely seven segments long and cylindrical. Scutum generally hairy all over and with scattered long bristles; humeral pits obscure.



Legs hairy or scaly, with long bristles; femora rather stout; basitarsi often shorter than segment 2; empodium present, usually as long as claws, very broad in females of *Pterobosca* and absent in males of *Trichoshelea*. Abdomen densely hairy or scaly and with long bristles. Wing broad in female and narrow in male; surface with dense decumbent hairs and also with fine microtrichia. Venation: Costa reaching about to middle of wing, in subgenus *Lasiohelea* often far beyond the middle; first radial cell very narrow and almost obliterated, second radial cell distinct, usually short, but in females of *Lasiohelea* often very long and narrow; distal part of Rs nearly always curved to costa and round or obliquely angulate at tip; intercalary fork of cell  $R_5$  present, but usually hidden by dense hairs; cross vein r-m very oblique; median fork with short stem and usually faint; fMCu at level of tip of  $R_1$  or more or less beyond it; alula short but fringed; squama with tuft of hairs. Male hypopygium not inverted, aedeagus usually shield-shaped, median lobes of parameres present or absent, when present slender and tapering, often fused at base or connected by transverse rod.

The species of this genus exhibit a considerable range of variation of structure. The most noticeable differences are shown in the development of scales on the wings, legs, and abdomen; in the segmentation of the antennae; in the venation of the radial veins; in the relative lengths of the first two segments of tarsi; and in the development of claws and empodia of legs.

*Pterobosca* is a group specialized to ectoparasitic life on dragonflies, but its basic characters are not highly different from those of *Lasiohelea*, with the exception of very large empodia and six or seven elongate distal antennal segments of the female. Moreover, the nonparasitic male of the genus is unknown and may not be so different from *Lasiohelea*.

This genus is very large and various attempts have been made to subdivide the genus by splitting off or creating new genera, subgenera, or groups. Saunders (1956) divided the genus into eight subgenera based on larval and pupal characters in addition to adult ones. His system seems to be most natural and at present I intend to adopt it with slight modification, adding *Lasiohelea* and *Pterobosca* as subgenera. Thus, *Forcipomyia* is divided into 15 subgenera, including a new subgenus, *Neoforcipomyia*, and four subgenera, A to D. The last four are provisional.

#### KEY TO SUBGENERA OF MALE FORCIPOMYIA

1. Parameres of hypopygium without caudal lobes extending caudal or with minute, rudimental, median caudal lobes..... 2
- Parameres of hypopygium with well-developed caudal lobes arising from middle part of basal arch of parameres, from mesal ends of parameres, or from lateral junction of parameres with bases of coxites..... 6
- 2(1). Sternite 9 with a large membranous window usually like Moorish arch; parameres consisting of one pair of subtriangular expansions in frontal plane ..... **Thyridomyia**
- Sternite 9 without window-like caudal membranous area or slightly concave at middle part of its caudal margin; parameres not consisting of one pair of subtriangular expansions, but one inverted, U-shape, trapezoid or triangular arch..... 3

- 3(2). Arch of parameres represented by subtriangular or trapezoid expansion in horizontal plane.....Subgen. **C**  
 Arch of parameres slender and cord-like..... 4
- 4(3). Aedeagus divided into pair of well chitinized sclerites each bearing strongly curved apex. Wing with vein Rs extending closely along costal margin, second radial cell very narrow and very long and bare areas (macrotrichia absent) along veins distinct and broad.....**Lasiohelea**  
 Aedeagus otherwise, usually shield-shape, subtriangular and sometimes consisting of small sclerites. Wing with vein Rs extending along costa for some distance, second radial cell subtriangular, subrhombic or elongate-subsquare and usually shorter than two-thirds of total length of Rs and macrotrichia of membrane rather densely spread and bare areas along veins almost absent or indistinct..... 5
- 5(4). Arch of parameres inverted V-shape and with top sharply pointed.....**Caloforcipomyia**  
 Arch of parameres inverted U-shape with broad, round top, trapezoid with flat top or inverted V-shape with small, round top.....**Proforcipomyia**
- 6(1). Caudal lobes of parameres arising from the joint-points of internal thickenings of parameres with bases of coxites..... 7  
 Caudal lobes of parameres arising from middle part of internal arch or, when internal arch is interrupted on middle part, from mesal anterior ends of basal arms..... 8
- 7(6). Parameres forming H-shape structure joined by cross bar.....**Trichohoelea**  
 Parameres with caudal lobes at lateral ends of internal arch and entire parameres forming U-shape structure.....**Neoforcipomyia**
- 8(6). Paired parameres never connected and widely separated.....**Synthyridomyia**  
 Parameres with common internal arch or narrowly separated on middle part of arch and caudal lobes arising from middle part of arch or, when the arch is narrowly interrupted, from mesal ends of diagonal arms..... 9
- 9(8). Basal arch of parameres always complete and caudal lobes of parameres entirely fused in mid-line, forming long, lanceolate, median common lobe .....**Metaforcipomyia**  
 Basal arch of parameres complete or narrowly interrupted at middle and two caudal lobes entirely separated or basally fused in some extent but not completely separated at least on apical part.....10
- 10(9). Lobes of parameres almost completely separated except for small common base, with hooked tips extending beyond aedeagus; wings thinly clothed with macrotrichia, unmarked and with costa reaching two-thirds of wing length .....**Warmkea**  
 Lobes of parameres separated in various extent, with tips usually sharply pointed or filiform and not hooked; wings densely clothed with macrotrichia, often adorned and with costa extending not far beyond middle of wing.....**Forcipomyia**

## KEY TO SUBGENERA OF FEMALE FORCIPOMYIA

1. Apical six or seven antennal segments distinctly longer than preceding basal segments; legs with empodia very broad and scalloped (male unknown) .....**Pterobosca**  
 Apical five antennal segments distinctly longer than preceding basal segments, or gradually elongate distally (without abrupt change between segments 9 and 10) or distal four somewhat elongate; legs with empodia normal ..... 2

2(1).	Two spermathecae .....	3
	Single spermatheca .....	8
3(2).	Distal five antennal segments not distinctly longer than preceding ones, but segments 9 to 13 subequal in length to 8 and last three segments stout; wing without vein $M_2$ .....	<b>Metaforcipomyia</b>
	Distal five antennal segments distinctly longer than preceding ones; wing with $M_2$ usually atrophied only at base to some extent.....	4
4(3).	Basal flagellar segments slender, elongate, two and even three times as long as wide. (Most specimens, but not all, with metallic jade green or deep blue pigmentation of subcutaneous granules).....	<b>Caloforcipomyia</b>
	Basal flagellar segments shorter than twice of width and flask-shape, short-oval, subspherical or more or less flattened and discoidal.....	5
5(4).	TR of hind legs less than 2.0 in both sexes.....	6
	TR of hind legs larger than 2.0 in both sexes.....	7
6(5).	Third maxillary segment with deeply or distinctly sunken, common sensory pore; wing almost always adorned with light and dark macrotrichia (often broad scales) and usually costa ending before middle of wing length measured from basal arculus to apex; legs of most species, but not all, with colored bands or markings and rather broad scales; hind TR usually 0.5-1.33.....	<b>Forcipomyia</b>
	Third maxillary segment with shallow sensory pore or without common sensory pore but with group of sensillae arising directly from surface of segment; wing never adorned, densely clothed with slender macrotrichia, and usually costa reaching middle of wing or slightly more measured from basal arculus; legs never marked with colored spots or bands and without broad scales (sometimes with very slender scales); hind TR 0.6-2.0.....	<b>Proforcipomyia</b>
7(5).	Basal flagellar segments of antenna depressed and distinctly discoidal, flagellar segment 10 far longer than twice length of 9.....	<b>Trichoshelea</b>
	Basal flagellar segments of antenna very slightly transverse, but gradually elongate distally becoming slightly longer than wide at segment 9 and generally subspherical; flagellar segment 10 shorter than twice length of 9.....	<b>Neoforcipomyia</b>
8(2).	Wing vein costa reaching two-thirds of wing length or more, Rs extending closely along costa and second radial cell fully twice as long as its stem part .....	9
	Wing vein costa ending at middle of wing or extending somewhat beyond middle but not reaching two-thirds of wing length, Rs not extending far along costa and second radial cell usually subtriangular, short and at most only slightly longer than its stem part.....	10
9(8).	Two apical segments of maxillary palp incompletely segmented, partly or completely fused.....	<b>Warmkea</b>
	Two apical segments of maxillary palp completely segmented and never fused .....	<b>Lasiohelea</b>
10(8).	TR of hind leg less than 1.0; wing and legs densely covered with broad scales and dark and pale markings as in some <i>Forcipomyia</i> ; basal flagellar segments long, flask-shape, and with neck parts.....	<b>Subgen. D</b>
	TR of hind leg more than 1.0; wings and legs without broad scales, but sometimes with lanceolate scales on tarsal segments and without colored markings; basal flagellar segments discoidal to short-oval and without neck parts.....	11
11(10).	Maxillary palp with two distal segments completely fused into one segment .....	<b>Subgen. C</b>
	Maxillary palp with two distal segments not fused, but distinctly separated by suture.....	12

- 12(11). Distal five antennal segments distinctly different from or longer than preceding basal segments, segment 10 longer than 1.4 times of 9.....13  
 Distal antennal segments becoming gradually elongate, no abrupt change between 9 and 10, segment 10 at most only 1.2 times as long as 9.....14
- 13(12). Hind TR very large, being 3.3-3.5; basal flagellar segments changing distally from discoidal to subspherical.....**Subgen. A**  
 Hind TR small, being 1.0-1.3; basal flagellar segments changing distally from subspherical to short-oval.....**Subgen. B**
- 14(12). Basal flagellar segments more or less discoidal, somewhat transverse and gradually becoming subspherical distally; moderate elongation of segments at 11 instead of at 10.....**Thyridomyia**  
 Basal flagellar segments subspherical and gradually elongate distally without abrupt change between segments 10 and 11 or with moderate elongation of segments between 9 and 10.....**Synthyridomyia**

Of the above 15 subgenera, *Warmkea* and *Metaforcipomyia* are not found in Micronesia as yet.

For the classification of *Forcipomyia*, I rely on the following as the main subgeneric characters: Structure of male hypopygium; number of spermathecae; development of female antenna; value of hind TR; segmentation of maxillary palp; wing venation; and development of scales and colored markings.

#### Subgenus *Forcipomyia*, s. str.

Small to rather large with scales and colored markings variously developed, especially on legs and wings. Male hypopygium with well-developed caudal lobes of parameres, which arise from middle part of basal arch of parameres or, when basal arch is interrupted at middle, from mesal ends of diagonal basal arms of parameres and quite separated from or basally fused, never entirely fused into one lobe; aedeagus shield-shape, subtriangular, pentagonal, rather variable in shape, but never separated into paired sclerites. Two spermathecae. Maxillary palp almost always distinctly five-segmented and palpal segment 3 with distinctly chitinized common sensory pore. Hind TR less than 1.33. Female antennal segments 2 to 9 flask-shape, with more or less well-developed neck parts, never depressed and somewhat longer than wide, at least subspherical; distal five segments abruptly elongate. Wings with thickly spread macrotrichia, no bare areas along veins, costa hardly reaching middle of wing, and at most never reaching beyond three-fifths of total wing length, first radial cell present or absent and second radial cell short, not much longer than its stem part, usually shorter.

#### KEY TO MICRONESIAN SPECIES OF SUBGENUS FORCIPOMYIA

1. Legs without distinct dark marking on paler ground color..... 2  
 Legs with distinct dark marking on paler ground color..... 5
- 2(1). Tibiae and femora of all legs mainly dark or brownish..... 3  
 Tibiae and femora of all legs almost entirely pale or yellowish..... 4
- 3(2). All femora broadly yellowish on basal halves; second radial cell of wing subtriangular and pointed apically; segment 3 of maxillary palp oval, and with sensory pore at middle.....**11. swezeyana**  
 All femora narrowly pale or yellowish on basal ends; second radial cell of wing suboval and round apically; segment 3 of maxillary palp slender, tapered, and with sensory pore before middle.....**12. claggi**

- 4(2). In female, hind TR 1.17-1.21. In male, hind TR smaller than 0.5; median lobes of parameres broadly fused basally.....13. *gressitti*  
In female, hind TR 0.91-0.98. In male, hind TR larger than 1.0; median lobes of parameres very slender and only slightly fused at base.....14. *edgari*
- 5(1). Legs with many dark dots.....15. *punctipes*  
Legs without dark dots..... 6
- 6(5). Abdomen with segment 8 yellow, forming yellow caudal band on brown caudal part.....16. *fascicauda*  
Abdomen without yellow caudal band, uniformly brown or with many intersegmental yellow bands..... 7
- 7(6). In all legs, tibiae with two dark bands and all tarsal segments each with single dark bands.....17. *penniornata*  
Not as above..... 8
- 8(7). Fore and middle legs without brown or dark bands; hind legs with only single, broad, preapical, dark bands on femora..... 9  
Middle and hind legs with dark bands.....10
- 9(8). In male, median lobes of parameres very broad at bases and not fused, except extreme bases.....18. *guamensis*  
In male, median lobes of parameres entirely slender and fused on basal two-thirds .....21. *tuthilli*
- 10(8). In male, median lobes of parameres broad. In female, hind tibia uniformly yellowish and rarely with ill-defined, obscure, brownish, sub-basal cloud .....11  
In male, median lobes of parameres slender. In female, hind tibia with distinct, dark, sub-basal band.....12
- 11(10). In male, median lobes of parameres fused basally less than half their length. In female, segment 3 of maxillary palp suddenly narrowed at apex; wing with broadest part before middle of wing length.....20. *flavitibialis*  
In male, median lobes of parameres fused basally more than half their length. In female, segment 3 of maxillary palp gradually narrowed apically; wing with the broadest part about at middle of wing length .....19. *subspadicifascia*
- 12(10). In male, median lobe of parameres fused basally about on one-third of length. In female, segment 3 of maxillary palp gradually narrowed apically and somewhat fusiform; spermathecae subspherical and small; cerci brown.....22. *esakiana*  
In male, median lobes of parameres fused basally only about on one-fifth of length or less. In female, segment 3 of maxillary palp suddenly narrowed apically; spermathecae oblong and large; cerci yellowish white .....23. *ornata*

**11. *Forcipomyia* (*Forcipomyia*) *swezeyana* Tokunaga and Murachi, n. sp.**  
(figs. 11, 12).

Brown to dark-brown; maxillary palpal segment 3 fusiform and sensory pore located at middle, female AR about 0.43 and basal short flagellar segments each with pair of stout, almost straight sensillae, male antenna including plumose hairs brown. Haltere dark brown or brown. Wing with pale-brown to brown hairs, scales absent. Legs without distinct dark marking, but tibiae and femora diffusely fuscous broadly. Female with two spermathecae, elongate oval, and subequal; male styles of hypopygium almost straight and narrow, aedeagus elongate and much longer than basal width and parameres with pair of slender median lobes fused only at base.

*Male*: Body length about 1.92 mm. Wing about 1.09 mm. by 0.34 mm.

Head brown and somewhat paler than in female; clypeus with 12 to 15 setae; proboscis very short; maxillary palp rather short, with five segments in proportion of 10:15:21.5:10:10, segment 3 fusiform, with shallow sensory pore at middle. Antenna including plumose hairs all brown, segments 2 to 10, 2 to 11, 2 to 12, 11 to 14, 12 to 14, and 13 to 14 in proportion of 115:152.5:180:115:77.5:50, distal eight segments in proportion of 11.5:11.5:13.3:13:37.5:27.5:20:28.8.

Thorax almost entirely brown, but scutum with pair of faintly yellowish vittae on anterior half of foveae and similar vitta on caudoscuteal area; scutellum with six strong

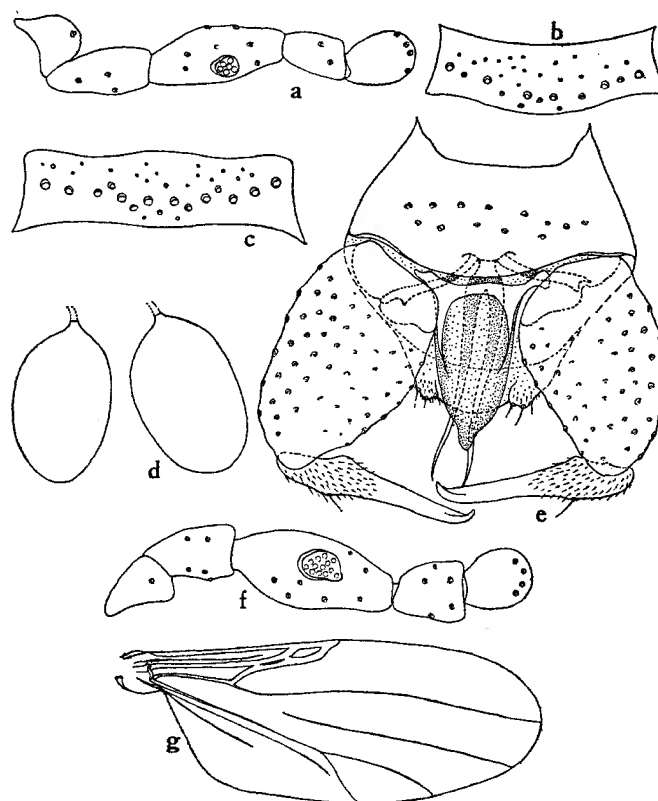


FIGURE 11.—*Forcipomyia* (*Forcipomyia*) *sweseyana*: a, maxillary palp, male; b, scutellum, male; c, scutellum, female; d, spermathecae; e, hypopygium, male; f, maxillary palp, female; g, wing (hairs omitted), female.

bristles and seven rather small setae in a line along caudal margin; pleural membranes yellowish pale brown. Legs with hind coxae pale brown, fore coxae paler brown, trochanters and tarsi yellowish pale brown. Femora and tibiae broadly fuscous; femora yellowish pale brown on basal half but middle and hind femora with distal ends paler and yellowish; fore tibiae broadly fuscous on basal half and yellowish pale brown on apical half; middle tibiae more broadly fuscous on basal two-thirds and yellowish on extreme base and apical one-third; hind tibiae mainly fuscous except for small yellowish basal and apical areas; scales of legs absent. TR of fore, middle, and hind legs about 1.19, 0.35,

and 0.71 (0.66-0.76); leg segments, except for basal two, in proportion of 112:106:39.5:36:25.5:20.5:18.5 in fore leg, 131.5:140.5:35:49:30:23.5:18.5 in middle leg, and 139:137:41:55.5:35:25.5:18 in hind leg.

Wing slender, with hairs pale brown and without scales. Venation: Costa short, ending far before middle of wing (38.5:83) and also far before level of fMCu, two radial cells obliterated and second radial cell a little shorter than its stem (20:22), relative lengths of R, R<sub>1</sub>, and Rs about 19.5:7.5:11, inner angle of fMCu slightly less than 45 degrees. Haltere brown.

Abdomen brown. Hypopygium mainly brown, but styles, lobes of parameres, and main part of aedeagus pale brown. Sternite 9 with caudal margin much broader than basal width (46:28) and almost straight or slightly convex; tergite 9 rather short, as long as sternite, and somewhat trapezoid. Coxites about 1.6 times as long as wide and slightly swollen basally; styles slightly shorter than coxites (32:38), almost straight, very gradually tapered, slightly curved at apices, and not distinctly swollen basally. Aedeagus elongate, about twice as long as wide, produced caudad beyond tergite 9, but not beyond ends of coxites, somewhat bell-shaped, its basal angles rather short and stout, its caudal projection round at tip; parameres consisting of two slender basal arms and a pair of slender median lobes, the former connecting dorsal bases of coxites to the bases of median lobes, median lobes very slender, extending far beyond tip of aedeagus, about twice as long as basal arms or more (37:16 or 17) and almost as long as coxites (37:38), two lobes fused only at bases between mesal ends of lateral arms.

*Female*: Body length about 2.1-2.2 mm. Wing about 1.12 mm. by 0.43 mm. General coloration darker or more brownish than in male.

Head dark brown, with proboscis very short; clypeus setigerous with about 20 setae; maxillary palp stout, brown, segment 3 swollen at middle and with large shallow sensory pore at middle, five segments in proportion of 11:15:23:11:9. Antenna dark brown, but segments 10 to 14 slightly paler, segments 2 to 9 with many verticils in a line and stout sensillae. Distal five segments not strongly elongate and only slightly longer than preceding short segments, and last segment hardly twice as long as 9, AR about 0.82 (0.8-0.84); distal eight segments in proportion of 12.7:12.3:12.3:14.3:14.5:15.2:16.8:24.3.

Thorax almost entirely dark brown, vittae of scutum very obscure; scutellum with 13 strong bristles and three small setae along caudal margin and about 20 minute accessory setae on anterior half. Legs with coxae pale brown to brownish yellow, other segments as in male; claws slender; scales absent. TR about 1.29 in fore leg, 0.87 in middle leg, and 0.78 in hind leg; proportion of leg segments about 118:115:46:34:24:20:18.5 in fore leg, 142:151:42.5:48:28.5:22:18.5 in middle leg, and 149:161:44.5:58.5:35.5:24:18 in hind leg.

Wing with brown hairs, veins brownish, membrane very pale brown, without scales. Venation: Costa ending at middle of wing (45:91), first radial cell slit-like, second radial cell subtriangular, shorter than its stem, and slightly longer than first radial cell, Rs ending just before costal end, relative length of R, R<sub>1</sub>, and Rs about 21:8:13, M<sub>1+2</sub> and bases of M<sub>1</sub> and M<sub>2</sub> broadly atrophied, fMCu under tip of costa, inner angle of fMCu smaller than 45 degrees. Haltere dark brown.

Abdomen dark brown, without scales; cerci brown and round; spermathecae two, subequal, oblong, brown, without chitinized duct, 11 by 17 units and 11 by 18 units.

*Larva*: Body elongate, cylindrical, segmentally constricted, about 3.75 (3.7-3.8) mm. long when full grown and pale yellow (preserved), with mouthparts, claws of pseudopods, and abdominal dorsal bands dark. Spines and bristles well developed and pale yellow, dorsal ones spear-shape; head hypognathous and smoothly round in profile; anterior pseudopod rather long, slightly bifid, and crowned with hooklets; posterior pseudopod represented by transverse ridge of two lines of hooklets; anal gills two, each unequally bilobate.

Head with two pairs of more or less lanceolate bristles before and beyond antennae on dorsal side, pair of minute setae between antennae and posterior dorsal lanceolate bristles, long seta on middle of lateral side, pair of long simple setae on middle of ventral side, pair of similar setae before anterior lanceolate dorsal bristles, three pairs of small

setae around mouthparts. Antenna rather long, conical, and arising from low tubercles. Mandibles slender and with four cutting teeth. Eye spots very small and constricted.

Thoracic and abdominal segments showing similar chaetotaxy generally bearing six pairs of different setae: dorsal ones spear-shape, next one slender and small, third one longest and with spinulose sculpture, fourth (lateral) one rather strong and poorly plumose, fifth and sixth (ventral) simple and slender; pro- and mesothorax with second and third setae quite isolated and second minute; metathorax and abdominal segments with dorsal

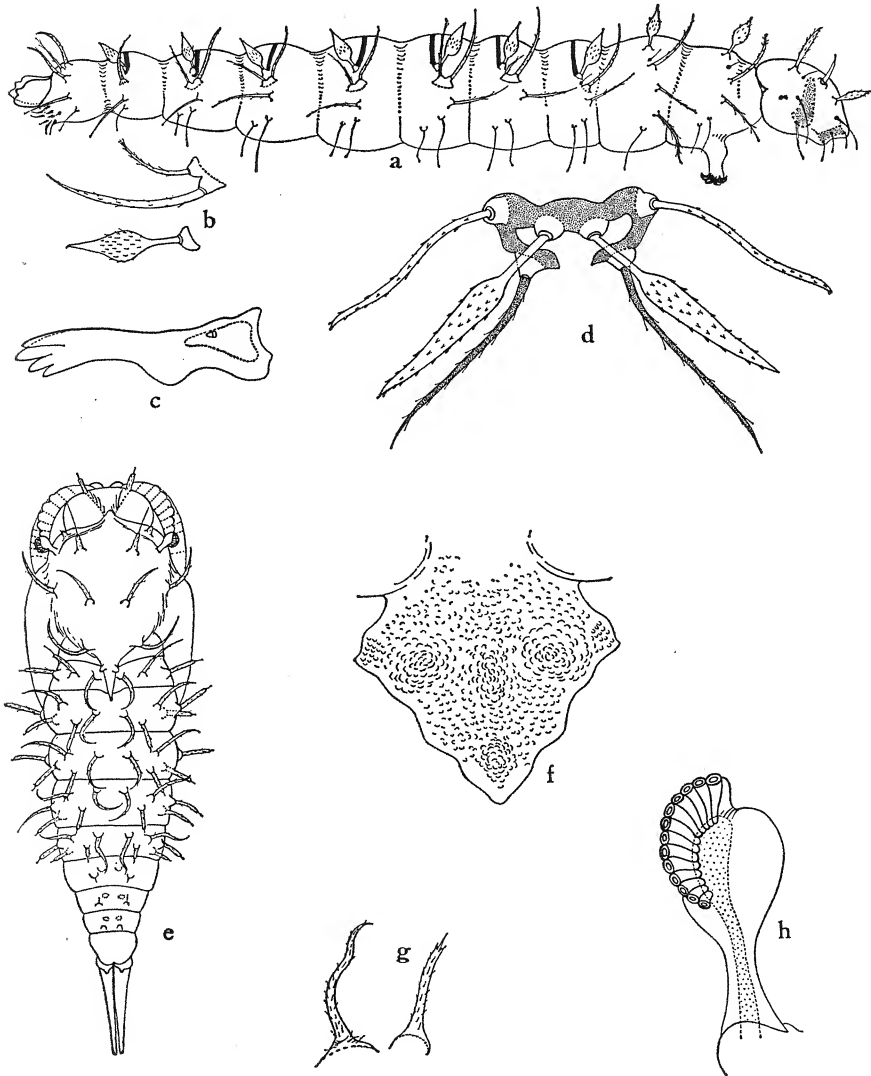


FIGURE 12.—*Forcipomyia* (*Forcipomyia*) *swezeyana*. a-d, larva: a, lateral aspect; b, spines and bristles; c, mandible; d, bristles of penultimate segment. e-h, pupa: e, dorsal aspect; f, operculum; g, spines; h, respiratory organ.



spear-like setae connected by transverse dark narrow bands, second and third setae arising from common tubercles; penultimate segment without second and sixth setae, ultimate segment with dorsal three pairs of setae arising from common basal sclerite, lanceolate first seta and without sixth seta. Anterior pseudopod slender, slightly bifid at tip, and each crowned with 16 dark, small booklets; posterior pseudopod represented by transverse ventral ridge with 18 rather large, black hooklets arranged in two lines; anal gills two, broad, bluntly bilobate unequally at tips.

**Pupa:** Body about 2.11 (1.86-2.34) mm. in length, very pale brownish yellow (preserved), retaining larval exuvia on posterior four segments, with many strong spines on thorax and anterior five abdominal segments; leg sheaths ending before segment 4, wing sheaths ending slightly beyond segment 2, thoracic dorsal caudal projection ending at anterior margin of segment 2, prothoracic respiratory organs round and with basal stems; operculum subrhombic and without setae; paired caudal sheaths of hypopygium long, slender, side by side, and with dorsal basal lobes bearing apical blunt processes.

Head with pair of short spinulose processes surmounted by short seta on region of vertex and pair of minute setae between bases of antennal sheaths. Antennal sheath large and each with several small blunt tubercles arranged in line along lateral side. Operculum somewhat rhombic, shagreened, and without setae.

Thorax with five pairs of spines and tubercles on dorsal side: pair of small tubercles on prothoracic region just before respiratory organs, pair of spinulose processes surmounted by long seta at level of respiratory organs, pair of spinulose trichoid processes at base of wings, similar paired processes at middle of mesonotal region and lateral sides of posterior part before caudal dorsal projection, pair of small tubercles on base of caudal dorsal projection. Respiratory organs with round apical knobs and short stems, spiracular papillae about 12 or 13, arranged in a row along caudal side of round knob. Caudal dorsal projection sharply pointed and ending at anterior margin of abdominal segment 2. Fore leg sheaths ending at anterior margin of abdominal segment 3, middle ones slightly beyond middle of segment 3; wing sheaths ending slightly beyond anterior margin of segment 3.

Abdomen gradually tapered, slightly shagreened on dorsal side, anterior five segments with spinulose trichoid and stick-like processes; segment 1 with one pair of trichoid and two pairs of stick-like processes, 2 with two pairs of trichoid and three pairs of stick-like processes, 3 to 4 each with similar five pairs and two small ventral simple tubercles each bearing minute apical seta; 6 and 7 without prominent cuticular processes, only with pair of minute setiferous dorsal tubercles and two pairs of minute ventral setae; 8 without dorsal tubercles; 9 with pair of slender, long, ventral sheaths of hypopygium, which are side by side and rather sharply pointed, and pair of shagreened, dorsal, blunt lobes.

Holotype, male (US 64021), Pt. Oca, Guam, at light, Dec. 16-20, 1945, Gressitt. Allotype, female (US), same data as for holotype.

**Paratypes:**

Guam. Three females, male (US, BISHOP), Pt. Oca, at light, June 29, July 16, 1945, G. Bohart and Gressitt; female, Piti, May 22, 1936, Swezey; female, Asan, Dec. 16, 1945, Gressitt.

Palau. Female (CM), Babelthuap, Dec. 22, 1947, Dybas.

**Other specimens:**

Tinian. Female, at northwest slope, Mt. Lasso, Mar. 17, 1945, Dybas.

Guam. Two females, three males, four larvae, nine pupae and 30 pupal exuviae, Pt. Oca, reared from larvae in rotting papaya-trunk, Nov. 1945, Stuntz.

**DISTRIBUTION:** Mariana Is. (Tinian, Guam), Caroline Is. (Palau).

This species is very similar in structure of the male hypopygium to *F.*

*ornata*, but much smaller, with darker femora and tibiae, and suboval or subfusiform palpal segment 3, differing from *F. ornata*. This species is named in honor of Dr. O. H. Swezey, who was the first to collect the midge on Guam.

*F. swezeyana* obviously belongs to Saunder's subgenus, *Forcipomyia s. str.*, on the basis of the larval and pupal characters beside the value of the hind TR and the structure of the male hypopygium. The chaetotaxy of the larva is very closely similar to that of *F. raleighi* Macfie known from rotting wood in rubbish heap in British Guiana, but, in the present larva, the dorsal side of abdominal segments has slender dark bands. The pupa is specific in possession of very well-developed spinulose processes.

## 12. *Forcipomyia* (*Forcipomyia*) *claggi* Tokunaga, n. sp. (fig. 13).

Medium-size, dark; wing with one (in female) or two (in male) black spots of slender dark scales on costal part. Maxillary palp slender and segment 3 with very small sensory pore, male antenna with segment 11 as long as 12 and 13 together; female antenna with basal flagellar segments spherical to short-oval and no neck parts, AR 1.1-1.22. Legs mainly dark, with knee joints narrowly yellow, scales very slender and hind TR about 0.51 in male and 0.95 in female. Wing with Rs curved upward and round at tip and first radial cell absent; halteres yellowish white. Male hypopygium with styles almost straight, aedeagus shield-shape and lobes of parameres separated at base, very slender, and needle-like.

*Male*: Body length about 2.52 mm. Wings about 1.34 mm. by 0.39 mm. General coloration black, but halteres yellowish white, knee joints yellowish, wings very pale but with two distinct dark costal spots.

Head entirely black including all appendages, with eyes contiguous above, proboscis about half as long as length of head capsule, clypeus with eight to 13 median setae and without lateral setae. Maxillary palp slender, segment 3 almost cylindrical, with sensory pore very small and sensillae produced from pore. Antennae with segment 11 longest and fully as long as 12 and 13 together; relative length of segments 2 to 10 and 11 to 14 together about 146:157 and those of distal eight segments about 14.5:14:14.5:15:60.8:34.5:26.8:31.3.

Thorax entirely dark; scutellum with 13 strong bristles and many small setae. Legs with slender scales, almost entirely dark, but trochanters and bases of femora paler, knee joints narrowly yellow, tibial ends and bases of tarsal segments somewhat paler, tarsal segments not so dark as in femora and tibiae; claws simple and slender; hind TR 0.51 (0.49-0.52), apical comb of hind tibia with five or six strong bristles. Distal seven leg segments with relative length of 149:146.5:56.5:34.5:32.5:25.5:19.5 in fore, 171:184.5:36:76.5:37.5:24.5:18 in middle, and 191.5:197.5:41:81:47:29.5:18.5 in hind leg.

Wing very pale, but with two distinct dark costal spots of slender scales: One covering distal half of costa, stem of second radial cell and  $M_{1+2}$  and one covering costal part before upper arm of intercalary fork, dark scales of these spots very fragile and often one or both spots appear to be absent. Venation: Costa ending before midway of wing (47:106), relative length of R, M, and stem of fMCu about 25:22:43, Rs only a little longer than  $R_1$  (11:9) and curved around at tip, first radial cell absent,  $R_1$  and Rs being anastomosed at this area, second radial cell oval, pale on distal half and little shorter than half of its stem (3:7.5), fMCu distinctly beyond costal end, base of  $M_2$  obscure,  $M_{3+4}$  longer than twice of  $Cu_1$  (38:16). Haltere yellowish white.

Abdomen entirely dark, almost without scales; hypopygium sternite 9 broad, about twice as wide as long and without caudal emargination; tergite 9 rather short and round on caudal margin; coxites rather short and suboval (44.5:26.5), styles almost straight, slender, slightly tapered, and much shorter than coxites (38:44.5); aedeagus shield-shape, broad, with basal membrane bare, basal arch very low, basal roots slender, caudal

margin round, and with median slender caudal thickening; parameres with basal lateral arms V-shape, median caudal lobes very slender, needle-like, as long as style (39.5:38), twice as long as lateral arm (39.5:19.5) and separated at bases.

*Female*: Body length about 2.15 (2.08-2.21) mm. Wings about 1.31 (1.29-1.33) mm. by 0.48 (0.47-0.49) mm. General structures and coloration closely similar to those of male with usual sexual differences; but legs with rather more distinct yellow bands or rings at bases of all tarsal segments and apical end of tibiae (rather broad at hind tibial end) and wings with costal dark spots in cell  $R_5$  less distinct; scales more thickly spread over surfaces of wings, legs and abdominal tergites.

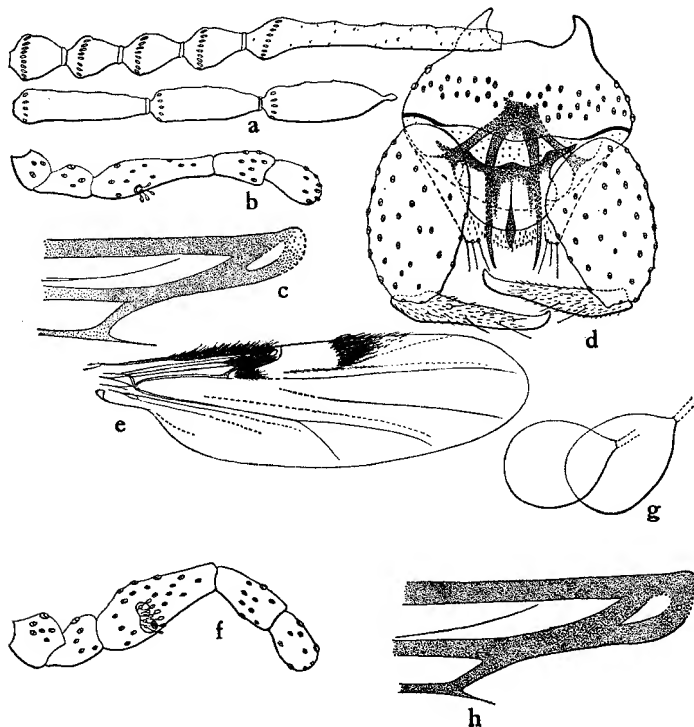


FIGURE 13.—*Forcipomyia* (*Forcipomyia*) *claggi*. a-e, male: a, distal eight flagellar antennal segments; b, maxillary palp; c, stigmal area of wing; d, hypopygium; e, wing (pale macrotrichia omitted). f-h, female; f, maxillary palp; g, spermathecae; h, stigmal area of wing.

Head entirely dark brown, with proboscis about three-fifths length of head capsule, eyes broadly contiguous above, clypeus with about 15 to 17 setae. Maxillary palp rather slender, densely setigerous, with sensory pore before middle of segment 3 and five segments in proportion of 13:14.5:30.5:15:13. Antenna with basal short flagellar segments with distinct neck parts (main segments missing).

Thorax entirely dark brown; scutellum with about 13 strong bristles along caudal margin and several bristles and many small setae on anterior half. Legs mainly dark brown, with yellow bands or rings and densely clothed with scales; claws simple and rather slender, empodia as large as claws, tibial comb of hind leg with seven to nine apical bristles, hind TR about 0.66; relative length of leg segments, except for basal two,

about 141.5:140.5:55.5:38.5:28:24.5:20 in fore, 172:187.5:39.5:69.5:34.5:26:21 in middle, and 189:194:48.5:73.5:41:29.5:25 in hind leg.

Wing densely clothed with brown macrotrichia, with dark, shaggy, slender scales on costa and radial veins, yellowish spot on base before arculus and obscure paler spot just beyond costal end. Venation: Costa ending well before middle of wing (43:100.5) and above fMCu, relative length of R, M, and stem of fMCu about 24:22:40.5, Rs strongly curved upward, short, and only a little longer than R<sub>1</sub> (10:12.5), first radial cell absent, second cell short-oval and about 0.6 as long as its stem vein (4.5:7.5), M<sub>3+4</sub> about twice as long as Cu<sub>1</sub> (35.5:18.5). Haltere yellow.

Abdomen brown on tergal and sternal sides and dark brown on pleural sides, with dense scales on tergal and pleural sides; cerci yellow; two spermathecae brown, oval, subequal (26.5 by 21 units and 23 by 18.5 units) and each with minute neck part.

Holotype, male (BISHOP 2752), Nimitz Hill, Guam I., May 4, 1956, Clagg. Allotype, female (BISHOP), Futami-ko, Chichi Jima, Bonins, May 10, 1956, Clagg. Paratypes, ten males, Mariana Is., with holotype; female, four males, with allotype, Bonin Is.

DISTRIBUTION: Bonin Is. (Chichi Jima), Mariana Is. (Guam).

This species is allied to *F. (F.) swezeyana* Tokunaga and Murachi in general coloration and structure of the male hypopygium, but these two species are different in the following points: In the male of *swezeyana*, segment 3 of maxillary palp is oval and not distinctly tapered apically; antennal segment 11 is rather short, about 2.7 times as long as 10 and 1.3 times of 12 (in the new species, about four times length of 10 and 1.8-2.0 times length of 12); the thoracic scutum has ill-defined yellowish spots on anterior parts of foveae (in the new species, entirely dark); the hind TR is smaller than 0.7 (0.49-0.52); the femora and tibiae are not almost entirely dark and the knee joints are rather obscurely yellow; the tarsal segments have no scales; the wings are uniformly brownish, without dark costal marking of scales; and the aedeagus is much broader than long.

**13. *Forcipomyia (Forcipomyia) gressitti* Tokunaga and Murachi, n. sp.**  
(fig. 14).

Yellowish-brown to brown; legs uniformly yellowish pale brown; maxillary palpal segment 3 very stout, middle part distinctly swollen ventrally and very narrow on apical quarter in male and rather slender, somewhat swollen sub-basally, and with common sensory pore just before middle in female; tarsi without, or with very narrow, scales; TR of hind leg about 0.42 in male and about 1.17 in female; wing with rather long costa which ends beyond middle of wing and second radial cell large, about 1.5 times as long as its stem veins in male and much longer than first radial cell in female; scutellum with ten strong bristles along caudal margin in male and eight in female; abdomen brown; parameres of male hypopygium with median lobes fused on basal half.

*Male*: Body about 1.88 mm. long. Wings about 1.18 mm. by 0.36 mm.

Head yellowish brown to brown; maxillary palp with five segments in proportion of 9:14.3:29.2:13:8; segment 3 thickened, but gradually narrowed on apical one-third and with rather large sensory pore at middle. Antenna with scape brown or more brownish than other segments, with plumose hairs pale brown; segments 2 to 10, 2 to 11, 2 to 12, 11 to 14, 12 to 14, and 13 to 14 in proportion of 125:66:197:139.5:98.5:67.5; proportion of distal eight segments about 12:12.5:13:14:41:31:29.5:38.

Thorax yellowish brown or uniformly brown, with membranous areas yellow; scutellum always brown and with 10 to 11 strong bristles and three or four small setae along caudal margin. Legs pale brown or yellowish brown and without dark or brown bands on femora and tibiae, without scales; claws slender and empodia rather large; TR about 0.62 in fore leg, 0.32 in middle leg, and 0.42 in hind leg; leg segments, except for basal two, in proportion of 126.5:130:38.5:62:30:24:19 in fore leg, 145.5:155:25:77:32:26:18 in middle leg, and 142.5:148.5:33.5:80:43.5:28.5:19 in hind leg.

Wing pale brownish gray in dry state. Venation: Costa ending beyond middle of wing (48:89) and just beyond level of fMCu, second radial cell rather large, about 1.5 times as long as its stem, first radial cell absent, and R, R<sub>1</sub>, and R<sub>s</sub> in proportion of 25:6:13.5. Haltere brown to yellowish brown.

Abdomen almost uniformly brown, but hypopygium yellowish brown or brown. Hypopygium with sternite 9 about 2 to 2.5 times as broad as long on caudal margin; tergite 9 somewhat broad and triangular, but caudal margin rather round. Coxites about

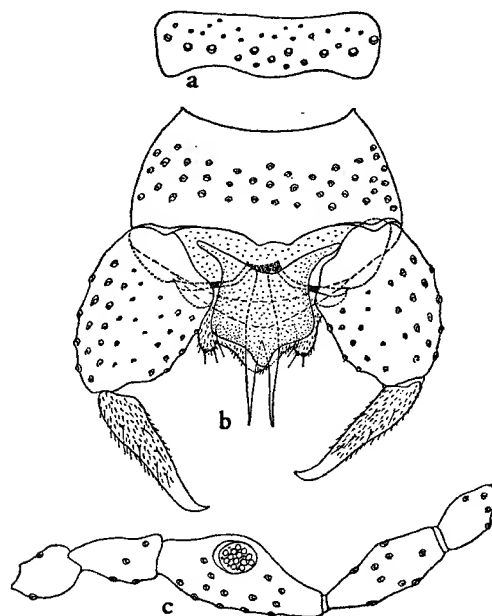


FIGURE 14.—*Forcipomyia* (*Forcipomyia*) *gressitti*: a, scutellum, male; b, hypopygium, male; c, maxillary palp, female.

1.5 to 2.0 times as long as basal width, extending far beyond tergite 9; styles much shorter than coxites (31.5:40), about five times as long as basal width (31.5:6.5), gradually tapered, with apical point more or less curved. Aedeagus broad, far shorter than distance between tips of basal angles (19.5:25.5) but as long as basal width of proper part, with basal angles prominent, shoulder parts obtuse, and caudal projection blunt and small; parameres consisting of two slender basal arms and a long bifurcate median lobe; basal arms connecting dorsal bases of coxites with base of medial lobe, and about one-third as long as median lobe (14.5:45.5), median lobe bifurcate on apical half and two apical parts straight, parallel, and sharply pointed.

*Female*: Body about 1.4-1.5 mm. long. Wings about 0.88-0.91 mm. by 0.38 mm.

Head with vertex brown, other parts all yellowish brown; eyes bare and broadly contiguous above; clypeus with six to eight median and four or six pairs of lateral setae.

Maxillary palp with five segments in proportion of 7.7:10:21.7:12.7:8.7; segment 3 not strongly swollen, but slightly swollen sub-basally, and with a rather large but shallow sensory pore just before middle. Antenna with scape brown, flagellum somewhat yellowish brown but more brownish than other parts of head, basal short flagellar segments round or oval, distal five segments oblong; AR about 1.11-1.17; distal eight segments in proportion of 9:8.7:9.3:14.5:14.5:14.5:14.3:21.8.

Thorax almost uniformly pale brown to yellowish pale brown; scutellum with eight strong bristles and three or four small setae along caudal margin and about 20 or 23 small setae on anterior part. Legs entirely yellowish pale brown, without scales; claws rather large and rather stout, very slightly thickened preapically; proportion of leg segments, except for basal two, about 93.3:95.7:41.3:24.8:17.8:14.7:12.7 in fore leg, 111.3:117:36:29.3:19.7:15.3:13 in middle leg, and 107.7:100:40.3:34.3:24:18.3:13.3 in hind leg; TR about 1.67 in fore leg, 1.23 in middle leg, and 1.17 in hind leg.

Wing rather short oval, with radial and costal veins yellowish brown, without scales, hairs all yellowish gray. Venation: Costa slightly produced beyond tip of Rs and ending slightly beyond middle of wing (37.3:68.6), Rs distinctly longer than R and about twice as long as  $R_1$  (18.7:12.7:9.7), two radial cells present, first cell very narrow, second cell long, somewhat triangular, and much longer than first cell (9.3:7.3), relative lengths of R and stem of fMCu about 12.7:30, fMCu under middle of second radial cell or a little before tip of Rs, tip of Cu<sub>1</sub> under or a little beyond costal end. Haltere entirely yellowish pale brown or pale yellow.

Abdomen almost entirely yellowish pale brown or pale yellow including cerci, without scales; two spermathecae slightly unequal, one short and oval and one round, both brown, each with very short chitinized duct, about 22.5 by 14 units and 17 by 13 units.

Holotype, male (US 64022), Ngarmalk I., ("NW Auluptagel") near Koror, Palau I., 25 m., light trap, Dec. 13, 1952, Gressitt. Allotype, female (US), Koror, Palau I., Nov. 22, 1947, Dybas. Paratypes, male, same data as for holotype; two females (BISHOP, CAS), Ton I., Truk, at light, Apr. 7, 1949, Potts.

Other specimen, female, Koror I., Palau Is., by light trap, May 2, 1957, Sabrosky. (In this female, the scutum is fuscous brown and has ill-defined, obscure, yellowish stripes on foveae instead of the almost entirely brown scutum of type specimens.)

DISTRIBUTION: Caroline Is. (Palau, Truk).

This species is very closely allied to *F. esakiana* in the structure of the male hypopygium, but the coloration is highly different from the allied species. Other allied species may be *F. sauteri* and *F. edgari*, from which *F. gressitti* may be distinguished by the difference of shape of maxillary palp, coloration of the scutum, ratio of the hind TR, and structure of the median lobes of the male hypopygium, as shown in the key to the species. It is a great pleasure to dedicate this species to Dr. J. L. Gressitt, who is in charge of the Micronesian project.

#### 14. *Forcipomyia* (*Forcipomyia*) *edgari* Tokunaga and Murachi, n. sp. (fig. 15).

Small yellowish, with slender scales on legs, abdominal tergites, and costal and radial veins of wings; segment 3 of maxillary palp rather short, strongly swollen on middle part, and with large sensory pore at middle; scutum with three broad brown vittae separated by pair of slender yellow stripes along foveae; male hind TR about 1.0; male

hypopygium with median lobes of parameres very slender, thread-like, and ending at end of tergite 9.

*Male:* Body length about 1.95 mm. Wing about 1.11 mm. by 0.33 mm.

Head with vertex brown, frons and mouthparts slightly pale brown, eyes broadly contiguous above; clypeus with about eight median setae and without (?) lateral setae. Maxillary palp with segment 3 rather stout, swollen on middle part, and with large sensory pores at middle; five segments in proportion of 8:12:25:12:9.5. Antenna with flagellar segments and plumose hairs brown and scape more brownish; segments 2 to 10 and 11 to 14 in proportion of 102:116; segment 11 longest, longer than, or subequal to, last segment; proportion of last eight segments about 9:10:11:11:33:29.5:22.5:32.

*Thorax:* Scutum with three broad brown vittae, obscurely separated by pair of

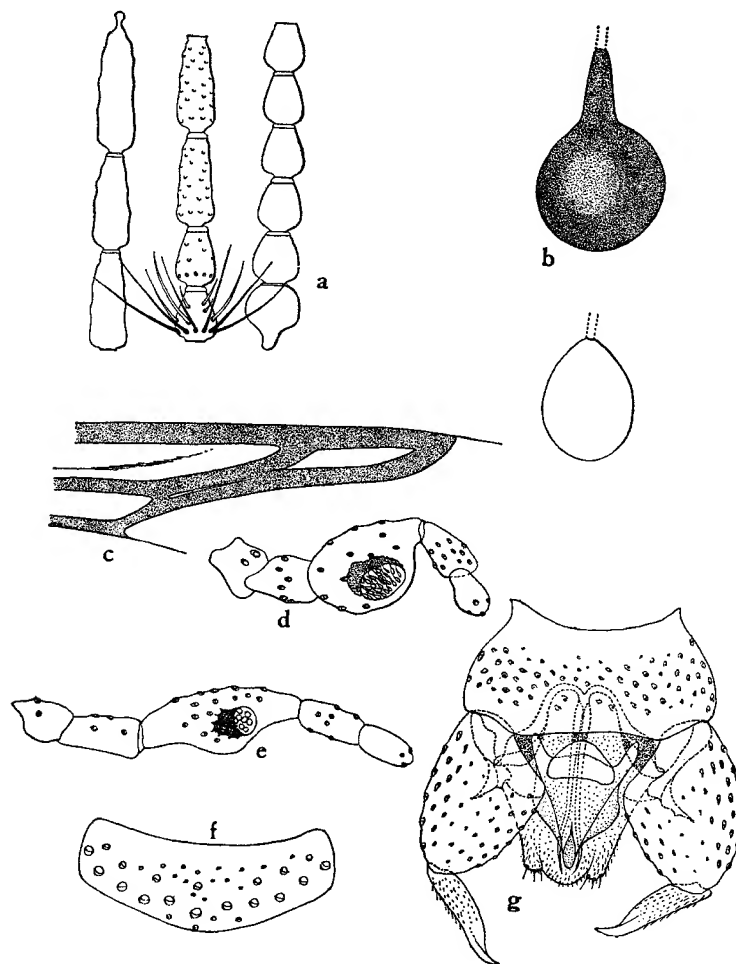


FIGURE 15.—*Forcipomyia (Forcipomyia) edgari*. a-d, female: a, flagellar antennal segments; b, spermathecae; c, stigmal area of wing; d, maxillary palp; e-g, male: e, maxillary palp; f, scutellum; g, hypopygium.

slender yellow stripes along foveae, humeral parts, caudoscuteal area, and lateral sides yellowish; scutellum yellow, with 11 strong bristles and four small setae along caudal margin; postscutellum dark brown; pleural and sternal sclerites yellowish brown. Legs all yellowish pale brown including coxae, with slender scales, tarsi somewhat darker due to dense scales; claws large and slender; empodia very large; TR about 1.1 in fore leg, 0.9 in middle leg, and 1.03 in hind leg; leg segments, except for basal two in proportion of 144:134:50:45:31:26:22 in fore leg, 160:163:43:46:32:27:21 in middle leg, and 162:155:55:53:38:31:20 in hind leg.

Wing white-gray in dry state; costal and radial veins with dark slender scales; hairs on membrane very slender and dense. Venation: Costa ending just before middle of wing (42:85), Rs about half of R (11:20), about twice as long as  $R_1$  and obliquely curved toward costal end at tip, first radial cell absent, second radial cell about 1.5 times as long as stem vein, stem of fMCu a little longer than R and Rs taken together (36:20+11), fMCu slightly beyond tip of costa. Haltere yellow.

Abdomen yellowish pale brown basally (on basal three segments) and brown on caudal segments; tergites with slender scales. Hypopygium brown; sternite 9 with many setae and its caudomesal part gradually membranized; tergite 9 somewhat triangular and round at tip. Coxites somewhat oval, about 1.5 times as long as wide (40.5:28), dorsal side of basal edge strongly thickened against lateral end of basal arm of parameres; styles much shorter than coxites (32:40.5), beak-like, slightly curved, and suddenly narrowed at tip. Aedeagus rather large, rather complicated, proper part polygonal, lateral parts somewhat thickened, caudal tip rather pointed, middle part of base bluntly projected backward, basal roots highly chitinized and rather slender, basal bridge-like structure strong, most highly chitinized and black. Parameres with paired, very slender, thread-like median lobes, these lobes longer than coxites, fused only at base, extending straight caudad and closely parallel except for apical parts which surround a small thickening of apical tip of aedeagus, basal lateral arms curved and narrow at base, but gradually broadened and ending against large basal thickenings of coxites.

*Female:* Medium-size, brown and yellow, with legs entirely yellow; abdomen, wings and legs densely clothed with scales. Basal flagellar segments spherical to oval and AR about 1.16; maxillary palp stout, segment 3 strongly thickened, short-oval and with large sensory pore at middle. Hind TR about 0.95. Wing with broadest part before middle, costa ending beyond middle of wing, first radial cell slit-like, second long. Two spermathecae; one dark brown, very large, and with well-developed neck part, one yellowish pale brown, oval, and without chitinized neck part.

Body length about 1.72 (1.63-1.82) mm. Wings about 1.17 (1.13-1.21) mm. by 0.47 mm.

Head dark brown including mouthparts, with eyes broadly contiguous above, proboscis little longer than half height of head capsule, clypeus with several median setae. Maxillary palp stout, segment 3 short-oval, strongly swollen, and with a very large sensory pore at middle, five segments in proportion of 7.5:10.5:20.5:13:8.5. Antenna with scape dark brown and other segments brown, basal short flagellar segments spherical to short-oval, without neck parts, with sensory hairs slender; AR about 1.16 (1.1-1.22), relative length of flagellar segments about 11:9.5:11:11:10.8:10.8:11:11.8:18.8:19.5:20.5:20.5:30.

Thorax mainly brown on tergal side and yellow on sternal and pleural sides, scutum with yellow lateral sides and humeral parts, scutellum yellow, with 14 bristles along caudal margin and about seven bristles and 18 small setae on anterior half. Legs entirely yellow, but tarsi brownish, densely clothed with three-striped scales, claws and empodia normal, hind TR about 0.95 (0.91-0.98), tibial comb of hind leg with six or seven apical bristles; relative length of leg segments, except basal two, about 115.7:123:49.3:41.7:25:21:18.5 in fore, 140.7:157.3:46.7:48.3:29.3:23.3:18.5 in middle, and 148:151.3:53.7:56.3:35.3:28.7:20 in hind leg.

Wing pale brown, densely clothed with brown scales, broadest before middle of wing. Venation: Costa extending beyond middle of wing (49.7:90) and ending at level of tip of  $Cu_1$ , relative length of R, M, and stem of fMCu about 22.8:20.3:37.5, Rs rather long and about 1.7 times as long as  $R_1$  (19:11.3), first radial cell slit-like, second cell rather long, subtriangular and little longer than first (8.7:7.7),  $M_{3+4}$  about twice as



long as  $Cu_1$  (30:15.7), fMCu under tip of  $R_1$ . Haltere with knob yellow and stem yellowish pale brown.

Abdomen with tergites brown, sternites yellowish brown, pleural sides dark brown, tergal and pleural sides with one- or two-striped scales; cerci yellow; two spermathecae: one large, round, dark brown, about 15+25 by 25.3 units, and with large chitinized neck part and one smaller, oval, yellowish pale brown, about 22 by 16 units, and without trace of neck part.

Holotype, male (CM), Saipan, Mariana Is., Nov. 21, 1944, Edgar. Allotype, female (BISHOP 2753), Futami-ko, Chichi Jima, Bonin Is., May 10, 1956, Clagg. Paratypes, eight females (BISHOP, CM), same data as for holotype.

DISTRIBUTION: Bonin Is. (Chichi Jima), Mariana Is. (Saipan).

This species is somewhat related to *F. sauteri* and *gressitti*. These three species, however, are distinctly different in the structure of the maxillary palp and the male hypopygium and the value of TR.

#### 15. *Forcipomyia* (*Forcipomyia*) *punctipes* Edwards (fig. 16).

*Forcipomyia punctipes* Edwards, 1928, Insects of Samoa 6 (2): 49 (Samoa). Macfie, 1934, Ann. Trop. Med. Parasit. 28 (2): 180 (Malaya).

Highly characteristic, with dark-brown or brown thorax, yellow legs provided with several dark dots on tibiae. In female, AR about 0.56, hind TR about 0.67, abdominal tergites mainly dark-brown and intersegmental area and tergite 8 yellow, abdominal sternites yellow in ground color and with many dark dots. In male, hind TR about 0.59, abdomen generally yellow, tergites with rather large dark-brown spots and sternites with many dark-brown dots, hypopygium with two strong blade-like median lobes basally fused.

*Female*: Body about 1.8 mm. long. Wing about 1.04 mm. by 0.43 mm.

Head including mouthparts dark brown or brown, with eyes broadly contiguous above; mouthparts very short. Maxillary palp stout and short; segment 3 strongly swollen on basal three-quarters and with rather large common sensory pore at middle; last segment oval and slightly longer than wide; proportion of five segments about 8.5:10:22:9:9.5. Antenna with scape black and other segments dark-brown or brown; basal flagellar segments 2 to 9 bottle-shaped, each with neck part shorter than basal swollen part, verticils strong and dark, sensillae dark, stout, and strongly curved; distal five segments somewhat elongate oval and not distinctly different in length from basal; AR about 0.56 (0.53-0.59); eight distal segments in proportion of 13.7:13.7:16.5:18.7:14.8:15.3:15.2:23.3.

Thorax with dorsal side uniformly dark brown or brown, pleural sides mainly yellow and with several small brown spots on either side, sternal side yellow. Legs without scales, mainly yellow; tibiae with several dark dots at bases of setae and tarsal segments with dark-brown apical bands. Marking somewhat different in different legs: In fore leg, coxa with a long dark-brown stripe on lateral side, trochanter and femur entirely yellow, tibia with four rather large dark-brown dots at bases of bristles on dorsal side, basal three tarsal segments with apical dark-brown or brown band, 4 with a broad yellowish-brown apical band, and 5 entirely yellowish brown; in hind leg, coxa with small dark-brown spot on lateral side, trochanter entirely yellow, femur with a dark-brown sub-basal and preapical band, four dark-brown dots between these two bands and about five minute dots on preapical part before preapical band, tibia with four rather large and four minute dark-brown dots arranged alternately on entire length, basal four tarsal segments each with apical dark band and 5 entirely yellowish-brown; in middle leg, coxa, trochanter, tibia, and tarsal segments as in hind leg, but femur with dark-brown sub-basal spot. TR about 0.86 in fore leg, 0.71 in middle leg, and 0.67 (0.64-0.68) in hind

leg; proportion of leg segments, except for basal two, about 121.8:123.6:37:43:25.3:21:20.7 in fore leg, 144.3:166:37.3:52.3:28.6:23.3:20.3 in middle leg, and 155.7:160.6:43:64.3:31.2:27.6:22 in hind leg.

Wing dark brown or black, thickly covered with dark decumbent hairs, with wing base yellowish and costal and radial veins with shaggy, dense black hairs, without scales. Venation: Costa not produced beyond tip of Rs and ending before middle of wing (40:84), Rs short, strongly curved at tip toward costa and about 0.6 as long as R (12:20), first radial cell slit-like, second radial cell somewhat triangular, short, and as long as first cell,  $M_{1+2}$  as long as r-m, base of  $M_1$  obscure, fMCu under costal tip,  $Cu_1$  ending at middle of wing. Haltere mainly yellow with a dark-brown spot on knob.

Abdomen with dorsal side mainly dark-brown and sternal side mainly yellow; dorsal side with distinct yellow intersegmental narrow bands, tergite 1 with pair of small lateral

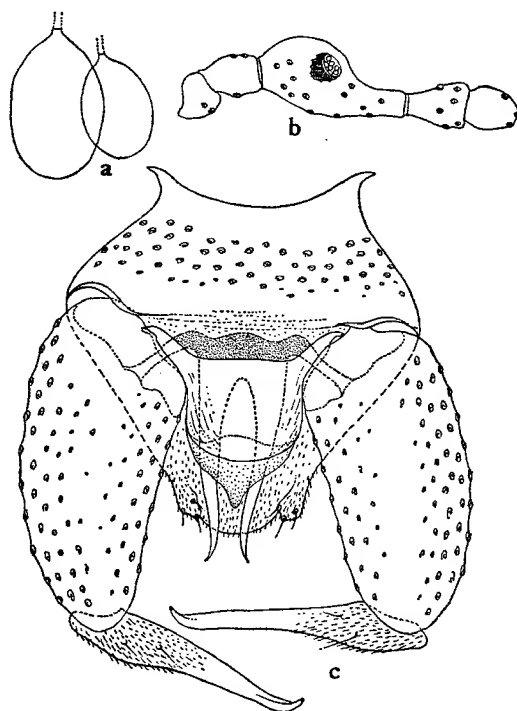


FIGURE 16.—*Forcipomyia* (*Forcipomyia*) *punctipes*: a, spermathecae; b, maxillary palp, male; c, hypopygium, male.

and pair of large median dark-brown spots in yellow ground color, tergite 8 entirely yellow, tergite 9 yellow and with pair of small dark-brown spots; sternites with about 40 minute brown dots at bases of setae; cerci yellow; two spermathecae oval, brown, distinctly unequal, 20 by 12.5 units and 15.5 by 11 units, with minute chitinized duct.

*Male*: Body about 2.17 mm. long. Wing about 1.13 mm. by 0.37 mm. Coloration and structure generally similar to those of female with usual sexual differences and different abdominal coloration.

Head with proboscis very short as in female; maxillary palp brown; segment 3 swollen ventrad on basal two-thirds and with common sensory pore at middle; five segments in proportion of 9.7:11.7:24:9:9.3. Antenna with scape dark brown, flagellum

and plumose hairs brown or pale brown, segment 11 longest, as long as preceding four segments together; segments 2 to 10, 2 to 11, 2 to 12, 11 to 14, 12 to 14, and 13 to 14 in proportion of 120:165.5:203.5:139.3:92.8:56; distal eight segments in proportion of 11.3:11.3:12:11.8:45.5:36.8:24.8:30.8.

Thorax as in female in color. Legs with similar dark-brown spots, bands, and dots as those of female, but tarsal segment 4 apically dark-brown as in preceding tarsal segments and segment 5 entirely yellow, slightly differing from female, fore tibia often with five dots including additional small dots just before apical end, hind femur with about ten dark-brown dots, more irregular in size and arrangement than in female, middle and hind tibiae each with three rather large and three small dark-brown dots arranged alternately. TR about 0.8 in fore leg, 0.58 in middle leg, and 0.59 (0.58-0.60) in hind leg; proportion of leg segments, except for basal two, about 137:137.7:39.7:49.7:29.7:23.3:20 in fore leg, 158:176:34.7:60.5:34.7:25.3:21 in middle leg, and 169.3:169.7:40:68.3:40:30.3:20.7 in hind leg.

Wing pale yellowish gray, with black shaggy hairs on marginal veins of second radial cell. Venation: Costa ending before middle of wing (41:89), Rs very short and only one-third as long as R (8:24), first radial cell absent, second cell short, subtriangular, and as long as stem, fMCu situated at middle of wing,  $M_{1+2}$  a little longer than r-m, base of  $M_2$  obscure. Haltere yellow with brown small spot on knob.

Abdomen yellow, with many dark-brown spots on tergal side and small dots on sternal side. Tergite 1 with pair of small lateral spots, 2 with pair of transverse spots along anterior margin and pair of small lateral spots at posterior corners, these two pairs often fused along lateral sides of tergite, forming pair of inverted L-shape spots, 3 to 7 with similar pair of inverted L-shape spots and median spot at anterior part, and 8 with faint median spot and pair of small lateral spots. Sternite 1 without spots or dots, 2 with small inverted U-shape median spot on anterior part and about six dots on median part of posterior half, 3 and 4 with pair of small semicircular lateral spots at anterior corners and about 14 to 20 scattered dots, 5 to 7 with about six to eight dots, and other caudal sternites entirely yellow and without spots and dots. Hypopygium yellow; tergite 9 with pair of large subtriangular dark-brown spots on caudal half and coxite with dark-brown spot on lateral side. Sternite 9 hardly three times as broad as median length at caudal part and broad median part of caudal margin gradually membranized; tergite 9 subtriangular and blunt at caudal tip. Coxites rather long, little longer than twice basal width (83:39), slightly tapered, and far beyond caudal tip of tergite 9; styles slender, almost straight, shorter than coxite (62.5:83), very slightly tapered, and slightly curved at tip. Aedeagus somewhat hood-shaped, with caudal one-third triangular and hyaline, basal broad part yellowish pale brown, basal angles rather slender and produced obliquely cephalad; parameres with very stout paired median lobes, which are blade-like, about as long as styles (61:62.5), a little beyond tip of tergite 9, fused on basal one-fifth and sharply pointed at tips, basal arms short, rather slender, and much shorter than basal median width (18.5:28).

DISTRIBUTION: Samoa, Malaya, Caroline Is.

PALAU. BABELTHUAP: Ngerehelong, male, light trap, May 1957, Sabrosky; Ngaremlengui, male, June 1957, Sabrosky. KOROR: Southwest part, male, light trap, Dec. 1952, Gressitt.

PONAPE. Colonia, three females, two males, light trap in Agric. Exper. Sta., Jan. 1953, Gressitt; Mt. Temwetemwensekir, 180 m., 12 females, ten males, light trap, Jan. 1953, Gressitt.

#### 16. *Forcipomyia* (*Forcipomyia*) *fascicauda* Tokunaga (fig. 17).

*Forcipomyia fascicauda* Tokunaga, 1940, *Tenthredo* 3 (2): 167 (Ponape).

Dark-brown or brown, rather small; legs mainly yellowish, but apical half of hind femur brown and hind tibia with brown sub-basal band; hind TR about 0.79 in female

and 0.64 in male; wing with dark dense hairs on costal and radial veins but without scales, three obscure pale spots in male and one in female along costal margin; abdomen mainly brown, but segment 8 in both sexes yellow; two spermathecae, oval, and distinctly unequal; median lobes of parameres of male hypopygium very long, slender, terminal parts thready, and quite separated.

*Female*: Body about 1.89 mm. long. Wing about 0.37 mm. by 1.38 mm.

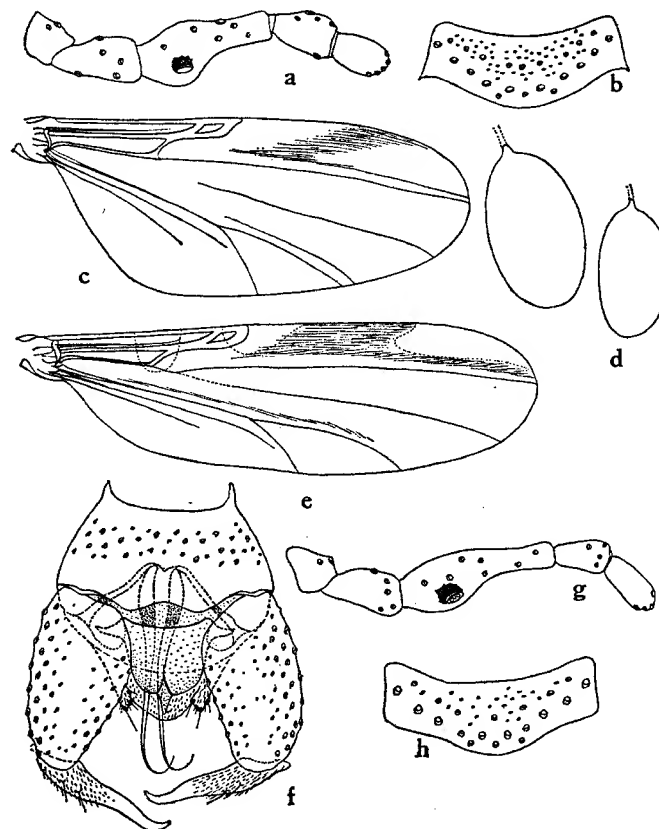


FIGURE 17.—*Forcipomyia* (*Forcipomyia*) *fascicauda*. a-d, female; a, maxillary palp; b, scutellum; c, wing (hairs omitted); d, spermathecae. e-h, male: e, wing (hairs omitted); f, hypopygium; g, maxillary palp; h, scutellum.

Head dark brown or brown including mouthparts and antennae, with eyes broadly contiguous above; clypeus with ten or 13 setae. Maxillary palp rather stout; segment 3 swollen on basal half and slender on apical half, with small sensory pore at middle of swollen part; five segments in proportion of 9.1:12.8:26.6:11:11.3. Antenna with AR about 0.72 (0.66-0.75), basal short flagellar segments somewhat bottle-shape, with short neck and pair of short, rather strong sensillae; distal five segments somewhat oval; distal eight segments in proportion of 12.9:12.6:12.5:14.5:14.6:14.5:14.8:23.6.

Thorax somewhat shiny, with tergal side dark brown or brown; scutum with anterior margin darker and small humeral pits yellow; pleural and sternal sclerites somewhat

paler than tergal; pleural membranes extensively yellow; scutellum with ten strong bristles, three small setae along caudal margin, eight or ten small setae and about 50 minute setae on cephalic half. Legs mainly yellow, coxae and basal four tarsal segments paler brown, hind femur brown on apical half or one-third and hind tibia also brown on sub-basal part; fore leg sometimes with pale-brown obscure bands on distal end of femur and sub-basal part of tibia; legs without scales; TR about 1.38 in fore leg, 0.83 in middle leg, and 0.79 (0.62-0.88) in hind leg; leg segments from femora to tarsi in proportion of 116.8:115.7:42.1:36:23.5:19.8:19.7 in fore leg, 141.7:155.2:40.1:49.8:26.7:20:19.3 in middle leg, and 159.8:149.8:45.3:57.2:31.5:24.7:20.5 in hind leg.

Wing dark gray, with shaggy dark hairs on costal and radial veins; small white spot, covering distal two-thirds of second radial cell and adjacent membrane of cell  $R_s$ , present along middle of costal margin, base of wing white; broadest part of wing little before middle of wing; scales absent. Venation: Costa just beyond tip of  $R_s$  and ending just before or at middle of wing (41.3:84),  $R_s$  short, about 0.6 as long as  $R$  (51.7:87) and about 1.5 times as long as  $R_1$ , first radial cell absent, second cell short, about as long as stem (26:25), r-m subequal to  $M_{1+2}$ , base of  $M_2$  obscure, fMCu at or beyond level of tip of  $R_s$ . Haltere yellow.

Abdomen with tergites entirely brown, sternites subdivided into paired brown hemisternites, segment 8 entirely yellow; cerci yellow; spermathecae two, large, oval, distinctly unequal, brown, 37.5 by 24.7 units and 26.9 by 20.6 units, each with minute, yellowish pale-brown, chitinized duct.

*Male:* Body about 1.87 mm. long. Wings 0.31 mm. by 1.22 mm.

Head and appendages brown; clypeus with about 12 setae; eyes broadly contiguous above; proboscis about half as long as height of head capsule. Maxillary palp rather slender; segment 3 much longer than two preceding or following segments taken together, with sensory pore before middle, basal half somewhat swollen and distal half slender; five segments in proportion of 8.9:13.8:25.8:11.1:11.8. Antenna with scape dark brown, other segments brown, including plumose hairs; segments 2 to 10, 2 to 11, 2 to 12, 11 to 14, 12 to 14, and 13 to 14 in proportion of 131:180.2:209.6:130.5:82.7:51; distal eight segments in proportion of 11.8:12.4:13.3:14.0:48.7:37.1:21.2:28.2.

Thorax with coloration closely similar to that of female; scutellum with similar number of bristles and setae along caudal margin, but its anterior half with about 30 small and minute setae. Legs with similar coloration to those of female, but tarsi all yellowish pale brown and fore legs almost always without femoral and tibial brown bands or clouds; TR about 0.96 in fore leg, 0.66 in middle leg, and 0.64 (0.58-0.69) in hind leg; proportion of distal seven segments about 123.4:121.5:41.7:39.4:26.1:21.5:20 in fore leg, 149.3:159.2:37.8:54.6:29.9:23.8:19.9 in middle leg, and 162.1:153.5:42.4:60.8:34.4:27.3:22.4 in hind leg.

Wing with brownish-gray hairs on membrane, dark hairs on costal vein, and brown hairs on other veins; wing base white, three white spots along costal margin; one covering r-m and adjacent veins, one covering distal half of second radial cell and adjacent membrane of cell  $R_s$ , and oblong spot along distal margin of cell  $R_s$  between forks of intercalary vein; scales absent. Venation: Costa not produced beyond tip of  $R$  and ending far before middle of wing (40:95),  $R_s$  rather short, much shorter than  $R$  (36:40), first radial cell absent, second cell as long as stem and round at tip, r-m subequal to  $M_{1+2}$ , base of  $M_2$  obscure, fMCu under or just beyond tip of  $R_s$ . Haltere yellow.

Abdomen yellow and brown; segment 1 yellow and its tergite with pair of oblique brown stripes and a pair of lateral pale-brown clouds, segments 2 to 4 yellow and tergites with pair of triangular brown spots arranged tip to tip; sternites also with pair of triangular brown spots on anterior corners, segments 5 to 7 brown on tergites and tergites with transverse narrow lunar yellow band along anterior and posterior margins, sternite 5 as in preceding segments, but following two sternites uniformly brown, segment 8 yellow, with pair of small brown clouds on lateral sides of tergite and sternite; pleural membranes brown and slightly fuscous, segment 9 and hypopygium dark brown. Hypopygium with sternite 9 with caudal margin somewhat produced caudad but shallowly concave at middle,

its posterior part about 2.5 times as wide as its median length (57:22); tergite 9 subtriangular, with caudal margin round. Coxites about twice as long as basal width (46:24), tapered, and far beyond tip of tergite 9; styles shorter than coxites (40:46), beak-like, very slightly curved, tapered, and apical one-third black. Aedeagus broad, round on caudolateral margins, with pointed, small caudal projection (probably a small perpendicular ridge), and basal angles subtriangular and pointed laterad. Parameres with pair of slender median lobes and lateral arms, median lobes much longer than coxites, quite separate, tapered, and ending in thread-like tips, basal arms slender, about 0.4 as long as median lobes, arising at basal ends of median lobes and extending laterocaudad, ending at dorsal bases of coxites, and two arms connected by very slender short thread at bases.

**DISTRIBUTION:** Caroline Is., Mariana Is.

Allotype, male (US), southwest Koror, 25 m., Palau, light trap, Dec. 1952, Gressitt.

**S. MARIANA IS. SAIPAN:** Chalan Kanoa, six females, eight males, light trap, Jan. 1949, Maehler; Exper. Sta., male, Jan. 1945, Hagen; As Mahetog area, May 1945, Dybas. **GUAM:** Pt. Oca, three females, May 1945, Bohart and Gressitt; female, light trap, Dec. 1945, Gressitt; Agana, male, Aug. 1952, Krauss.

**PALAU. BABELTHUAP:** Ngerehelong, six females, 29 males, May 1957, Sabrosky; Ulimang, female, at light, Dec. 1947, six females, three males, Dec. 1947, Dybas; Ngiwal, five females, three males, May 1957, Sabrosky; Ngaremlengui, 67 females, 131 males, light trap, June 1957, Sabrosky; Melekeik, seven females, 12 males, May 1957, Sabrosky; Imeliik, nine females, male, June 1957, Sabrosky; Ulimang, Dec. 1947, Dybas. **KOROR:** 44 females, 68 males, at light, Apr., May 1957, five females, male, at light, July 1957, Sabrosky; two females, Nov., Dec. 1947, Dybas; ten females, Nov. 1947, Dybas; 36 males, with allotype, Dec. 1952, Gressitt; 12 males, light trap, Apr. 1953, Beardsley; Ngarbaged, female, Nov. 1937, Murakami; southwest, 25 m., 32 females, 22 males, light trap, Dec. 1952, Gressitt. **PELELIU:** Six females, 30 males, at light, May 1957, Sabrosky; four females, July 1945, Dybas; Mt. Amiangal, ten females, five males, light trap, Dec. 1952, Gressitt.

**YAP. YAP:** Two females, male, July-Aug. 1950, Goss; Dugor, Weloy, four females, June 1957, Sabrosky; Yaptown, male, July 1946, Townes; Kolonia, male, June 1957, Sabrosky. **GAGIL-TOMIL:** Tomil Distr., two males, July-Aug. 1950, Goss.

**CAROLINE ATOLLS. KAPINGAMARANGI:** Hare I., male, Aug. 1946, Townes.

**PONAPE.** Agric. Exper. Sta., Colonia, 16 m., male, light trap, Jan. 1953, Gressitt; southeast Nanpohnmal, female, Jan. 1953, female, light trap in native forest, Jan. 1953, Gressitt; south of Nanpohnmal, six males, light trap in mountain, Jan. 1953, Gressitt; Mt. Temwetemwensekir, 180 m., ten females, ten males, Jan. 1953, Gressitt.

**KUSAIE.** Mutunlik, 22 m., five females, five males, light trap, Feb., Apr. 1953, Clarke; Hill 1010, 300 m., male, light trap, Apr. 1953, Clarke.

17. *Forcipomyia* (*Forcipomyia*) *penniornata* Tokunaga and Murachi, n. sp.  
(fig. 18).

Dark-brown; wing with dark marking of dark hairs on gray ground color; legs with many dark-brown bands on femora, tibiae, and tarsi. In male, TR of hind leg about 0.74, five anterior abdominal tergites broadly pale brown or yellowish on median part, aedeagus with pair of recurved slender median lobes, and parameres with pair of median lobes widely separated at base. In female, dark marking of wing distinct, large, and confluent, antenna dark brown, basal flagellar segments short with short and stout sensillae and AR about 0.98.

*Male*: Body about 2.02 mm. Wing about 1.21 mm. by 0.33 mm.

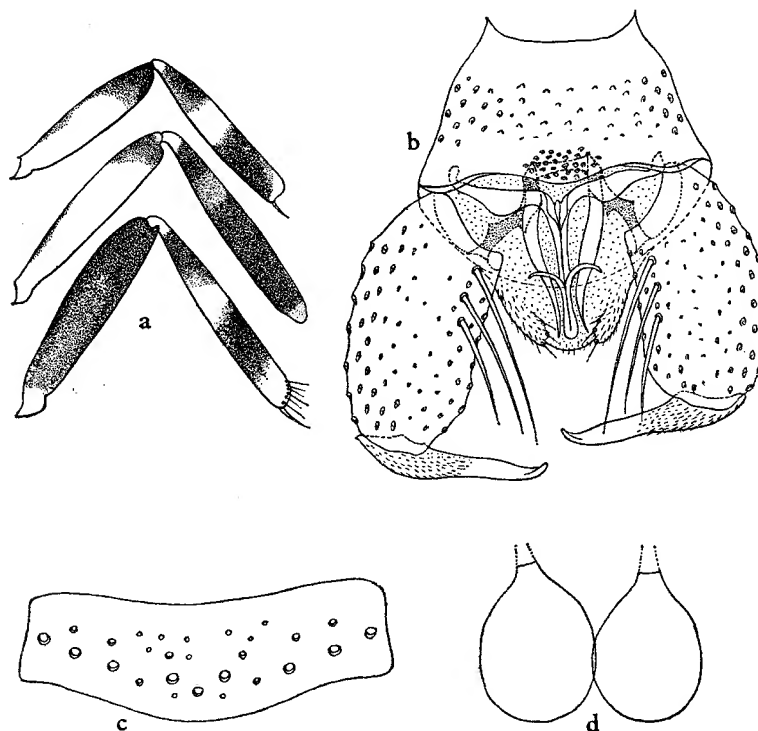


FIGURE 18.—*Forcipomyia* (*Forcipomyia*) *penniornata*: a, femur and tibia, female; b, hypopygium, male; c, scutellum, female; d, spermathecae.

Head brown; clypeus with about eight setae; proboscis about three-fourths as long as height of head capsule. Maxillary palp brown; segment 3 rather slender, fusiform, with small sensory pore just before middle; five segments in proportion of 8.5:11:26:9.6:11.6. Antenna with scape dark brown, nine short basal flagellar segments and plumose hairs brown, segment 11 longest, basal swollen part and plumose hairs brown but distal cylindrical part pale brown, following three distal segments entirely pale brown, terminal stylet short and ending in round tip; segments 2 to 10, 2 to 11, 2 to 12, 11 to 14, 12 to 14, and 13 to 14 in proportion of 124.3:165.3:198.5:133:91.5:58.3; distal eight segments in proportion of 12:12.5:14:15.3:41.8:34.3:26.5:32.6.

Thorax with tergal side dark brown, sternal and pleural sides brown. Legs without scales, with many dark-brown bands; coxae pale brown or brown, other segments yellowish or pale brown in ground color; in fore leg, femoral end narrowly brown, tibia with a narrow sub-basal and broad middle dark-brown band, tarsal segments with middle dark-brown band but in distal three segments bands obscure, uniformly brown; in middle leg, femur brown basally, dark brown apically, and without yellowish part, other segments as in fore leg; in hind leg, femur narrowly dark brown apically and other segments as in fore leg. Three pairs of legs with segments, except for basal two, in proportion of 119.8:118.8:47.3:37.5:25.3:21:17.2 in fore leg, 147.5:151.3:34.4:61:30.5:22.8:18.8 in hind leg; TR about 1.31 in fore leg, 0.64 in middle leg, and 0.76 (0.68-0.84) in hind leg.

Wing with only very slender dark scales on radial veins, gray in ground color, and with dark spots; costal area with five spots: one covering middle parts of veins, costa, R, and M, one spot covering two radial cells but not covering extreme base of first and tip of second cell, three spots in cell  $R_5$ , of which apical one is largest and covers apical part of cell. Other spots are one small spot covering base of M, one rather distinct spot covering fMCu and Cu<sub>1</sub>, one small spot covering each tip of  $M_2$  and  $M_{3+4}$ , one spot arising from sub-basal part of stem of fMCu, and extending obliquely toward anal margin. Venation: Costa ending before middle of wing (49:102) and not produced beyond tip of  $R_s$ ,  $R_s$  rather short, about 0.37 as long as R (42:115), second radial cell short, triangular, shorter than its stem (13:20), first radial cell absent, r-m about half as long as  $M_{1+2}$ , fork of  $M_{1+2}$  obscure, base of  $M_2$  narrowly atrophied, fMCu slightly beyond tip of costa. Haltere pale brown.

Abdomen brown, but basal five tergites broadly yellow or pale brown in middle, hypopygium dark brown but styles yellowish pale brown. Hypopygium: Sternite 9 with basal width little broader than length and posterior part about twice as wide as long, caudomesal part bluntly produced caudad and setigerous with rather small setae; tergite 9 somewhat triangular, but caudal margin round. Coxites about 1.7 times as long as wide, extending far beyond round caudal end of tergite 9, with three very strong bristles on mesal side of basal area; styles rather slender, shorter than coxites (50:58), tapered, almost straight, but very slightly curved at tip. Aedeagus with large basal roots, which extend laterad toward laterobasal angles of coxites and curve cephalad at tip, median part very narrow, slender, extending caudad near caudal end of tergite 9, then suddenly recurved backward and separated into two slender cords, divergent horizontally at middle of first section of medial part of aedeagus. Parameres mainly consisting of lateral arms and paired median lobes, lateral arm irregularly angulate, divergent caudad, ending at mesal angle of base of coxite and two arms connected by rather large bar about two-thirds as long as lateral arms, median lobes rather slender, tapered, pointed at tip, arising from bases of lateral arms, extending and diverging caudad with slight curve, ending separately at caudal turning point of aedeagal median lobes.

*Female:* Body about 1.73 mm. Wing about 0.93 mm. by 0.35 mm. General structure and coloration similar to those of male with usual sexual differences.

Head and appendages dark brown. Maxillary palp rather stout; segment 3 with basal two-thirds oval and with sensory pore at center; five segments in proportion of 8:9:24.5:8:11.5. Antenna dark brown, with AR about 1.0 (0.95-1.01), basal short flagellar segments subspherical, with very short neck part and pair of stout, short, brown and horn-like sensillae, verticils brown, ultimate segment with very short, round, terminal stylet; distal eight segments in proportion of about 12.8:11.5:12.5:16.8:17.5:18.5:20:26.5.

Thorax with tergal sclerites brown to dark brown, pleural and sternal sclerites brown to pale brown; scutellum with nine to 11 strong bristles and two to four small setae along caudal margin and with about 12 or more small setae on anterior half. Legs similar in color to male, but coxae paler, being only pale brown or brown on lateral side, and femora slightly different: fore femur rather broadly pale brown apically, middle femur brownish on dorsal side and on apical one-third, and hind femur mainly brown and narrowly yellowish pale brown basally. TR of fore leg about 1.38, that of middle leg, about 0.75 and



that of hind leg, 0.91; leg segments in proportion of 104.5:106:42:30.8:21:17.3:18.8 in fore leg, 130:139.5:37.5:50:25.8:20.5:17.3 in middle leg, and 139.5:143:42.5:46.5:30.3:23:19 in hind leg.

Wing much darker than in male, dark spots confluent, and remaining several yellowish-gray spots among dark spots; wing base yellow; very slender scales present on radial veins. Pale spots: round one covering r-m and adjacent parts of related veins; small round spot covering tip of second radial cell; small oval spot on basal one-fourth of vein  $M_1$ , these two sometimes subconfluent; obscure, rather large, round spot at middle of cell  $R_5$ ; broad and subconfluent dark marking covering veins  $M_1$ ,  $M_2$ ,  $M_{3+4}$ ,  $Cu_1$ , and stem of fMCu; and pale spots found on distal parts of related wing cells. In anal cell long dark spot extending obliquely from wing base to middle of wing margin of cell. Venation: Costa ending just beyond middle of wing (36:69),  $R_s$  short, being two-thirds as long as  $R$ , first radial cell absent, second cell subtriangular and as long as its stem, fMCu under tip of  $R_1$ , tip of  $Cu_1$  just beyond tip of costa, not produced beyond tip of  $R_s$ . Haltere pale brown to brown.

Abdomen with tergites and sternites brown and not reduced, pleural membranes slightly dusted darkly; cerci brown and normal; two spermathecae brown, oval, subequal, with short chitinated duct, 16.5 by 12 units and 15 by 12 units.

Holotype, male (US 64023), Pt. Oca, Guam, Dec. 20, 1945, Gressitt. Allotype, female (US), Koror I., Palau Is., at light, Sept. 16, 1952, Beardsley.

Paratypes, five males (BISHOP, CM), Pt. Oca, Guam, Mariana Is., Dec. 20, 1945, Gressitt. Palau: Female, male, Koror, at light, Sept. 16, 1952 and May 1953, Beardsley; female, male, southwest Koror, light trap, Dec. 5, 1952, Gressitt; male, Mt. Amiangal, Peleliu, light trap, Dec. 22, 1952, Gressitt. Yap: Male, Tomil District, Gagil-Tomil, July-Aug. 1950, Goss.

Other specimens, male, Chichi Jima, Bonin Is., May 10, 1956, Clagg; male, Marpo Valley, Tinian, Mariana Is., Oct. 15, 1945, Dybas. Palau: Five females, Ngaremlengui, Babelthuap, June 3, 1957, Sabrosky; three females, male, Koror, light trap, May 29, 1957, Sabrosky.

DISTRIBUTION: Bonin Is. (Chichi Jima), Southern Mariana Is. (Guam, Tinian), Caroline Is. (Palau, Yap).

This new species is somewhat allied to *F. mira* Johannsen reported from west Java and *F. annulipes* Tokunaga from Japan. But in *E. mira*, segment 11 of the male antenna is almost equal in length to segment 12 and 13 together (24:14+11), the female AR is about 0.88, hind TR of male is about 0.57 and that of female is about 0.78, and the median lobes of parameres of male hypopygium are highly different, simple, slender, and needle-like. In *F. annulipes*, the AR of the male antenna is much smaller than 1.7 (1.15) and that of the female is smaller than 1.0 (0.74-0.88) the femora and tibiae of legs have a single, large, dark, median cloud, the hind TR is about 1.24 in the male and 1.24-1.36 in the female, and the male hypopygium has clavate styles and no median lobes of parameres. *F. penniornata* is highly characteristic in the recurved median lobes of the parameres. The species name is related to the distinct dark markings of the wing.

18. *Forcipomyia* (*Forcipomyia*) *guamensis* Tokunaga and Murachi, n. sp  
(fig. 19).

Yellow and brown; scutum brown, yellowish on median part of anterior half and pale brown on lateral parts of caudal half; scutellum pale brown with 11 strong bristles and two small setae along caudal margin, legs mainly yellow, but hind femur with pale-brown broad band on distal half; wings with costa short, ending before middle of wing, Rs round at tip and without scales. Abdominal tergites brown, with inverted triangular paler spot and pair of oblique dark stripes along lateral sides of paler triangular spot; hypopygium with claw-like styles; median lobes of parameres very broad at base and basally fused, separated parts tapered, and ending in very slender filaments.

*Male*: Body about 2.02 mm. long. Wing about 1.14 mm. by 0.33 mm.

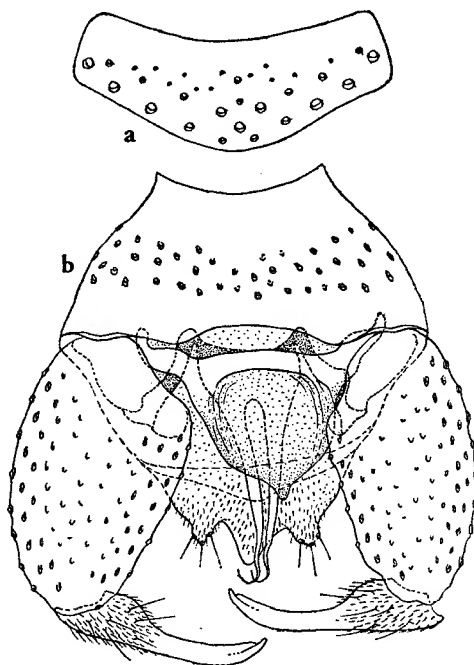


FIGURE 19.—*Forcipomyia* (*Forcipomyia*) *guamensis*: a, scutellum, male b, hypopygium, male.

Head pale brown, with vertex brown, mouthparts pale brown, proboscis shorter than one-third of height of head capsule; clypeus with about nine setae; eyes bare and broadly contiguous above; maxillary palp broken. Antenna with scape brown, flagellum and plumose hairs brown; proportion of distal eight segments about 13:14:16:16:58:30:26:?

Thorax brown; scutum with large yellowish, pale-brown median spots on anterior half and pair of small pale-brown, obscure spots on lateral sides of caudal half; scutellum pale brown, with 11 strong bristles and two small setae along caudal margin and about 20 small and minute setae on anterior half; pleural membranes very pale brown. Legs with coxae and trochanters very pale brown and other segments yellow, but hind femur with pale-brown broad band on apical half; claws large and slender; middle TR about

0.85; proportion of leg segments, except for basal two, about 135:142:57:?:?:?:? in fore leg, 154:171:53:62:36:30:20 in middle leg, and 159:165:57:?:?:?:? in hind leg.

Wing without scales and colored marking, uniformly pale gray. Venation: Costa ending distinctly before middle of wing (40:88), relative length of R, R<sub>1</sub>, R<sub>s</sub>, and stem of fMCu about 22:8:12:37, R<sub>s</sub> curving toward costa with its round tip, second radial cell subtriangular and slightly longer than stem (22:20), fMCu distinctly beyond tip of R<sub>s</sub>. Haltere dark brown.

Abdomen, including hypopygium, brown and without paler bands between segments, with scales very slender; tergites with median, large, inverted triangular pale spot and pair of dark-brown, oblique stripes along lateral sides of pale triangle. Hypopygium with sternite 9 with anterior width about one-half of caudal width and about 1.3 times as broad as long (28:57:21), caudal margin slightly concave broadly at middle; tergite 9 subtriangular and somewhat pointed at tip. Coxites almost straight, conical, about twice as long as wide (44:23); styles slightly arcuate, swollen on basal one-third, slender on apical two-thirds, and much shorter than coxites (34:44). Aedeagus broad, bell-shape, basal angles produced laterocephalad and rather long, median part with basal margin very slightly convex, shoulder parts obtuse, caudal projection small and ending before caudal tip of tergite 9. Parameres with lateral arms rather strong, as long as common basal width of median lobes; median lobes fused at basal one-fifth, but fused part very broad, separated parts of lobes tapered, ending in fine filaments at tip and just beyond tip of tergite 9.

*Female*: Unknown.

Holotype, male (US 64025), Mt. Bolanos, Guam, Aug. 1952, Krauss.

DISTRIBUTION: S. Mariana Is. (Guam).

This species somewhat resembles paler specimens of *F. esakiana* Tokunaga in general coloration, but the abdominal tergal pattern and the structure of parameres are quite specific. The new species is also related to Palearctic *F. pallida* Winnertz, but in *F. pallida* the legs are entirely yellowish except for brownish coxae and without brownish preapical bands on hind femora, the second radial cell is shorter than its stem, differing from *F. guamensis*, in which it is longer than the stem vein, and the median lobes of parameres are rather broad, suddenly narrowed apically, and extended caudad in parallel position, differing from *F. guamensis*, in which the lobes are gradually narrowed, ending in fine filaments, and convergent distally. The holotype lacks complete appendages, but the characteristic structure of the male hypopygium is thought to represent the important specific feature of the species.

#### 19. *Forcipomyia* (*Forcipomyia*) *subspadicifascia* Tokunaga and Murachi, n. sp. (fig. 20).

Dark-brown and rather large; legs mainly yellow or yellowish pale brown; middle and hind legs with distinct dark-brown preapical band on femur, small sub-basal dark-brown band on middle tibia, and in some males hind tibia also with similar band and very obscure brownish small cloud on sub-basal part of tibia and on preapical part of femur. Female abdomen with tergites uniformly brown and with many dark-brown scales; male abdomen also with uniformly brown tergites. Male hypopygium with broad median lobes of parameres fusing on basal half. Female antenna with basal short segments not yellowish but all brown, maxillary palpal segment 3 gradually narrowed on apical half, wings with broadest part about at middle, and femoral dark-brown preapical bands small on middle and larger on hind femur, but not larger than one-third of hind femur.

*Male*: Body about 2.3 (2.8-2.34) mm. long. Wing about 1.31 mm. by 0.48 mm.

Head almost uniformly dark brown; clypeus with about six setae; proboscis about half as long as height of head capsule. Maxillary palp slender, with five segments in proportion of 12:17:38:23:9; segment 3 rather slender, only slightly thickened at middle, and with sensory pore just beyond middle. Antenna with scape dark brown, other parts including plumose hairs brown; distal eight segments in proportion of 13.8:14.3:15.3:17.5:53.5:37.5:31.8:40.5; proportion of segments 2 to 10 and 11 to 14 about 143:158.5.

Thorax dark brown, with humeral parts and lateral margins of scutum darker than median part, pleural and sternal sclerites brown; scutellum brown, with three or five median and ten strong lateral bristles, two or three small median setae along caudal margin, and about 25 small and minute accessory setae on anterior part; pleural membranous

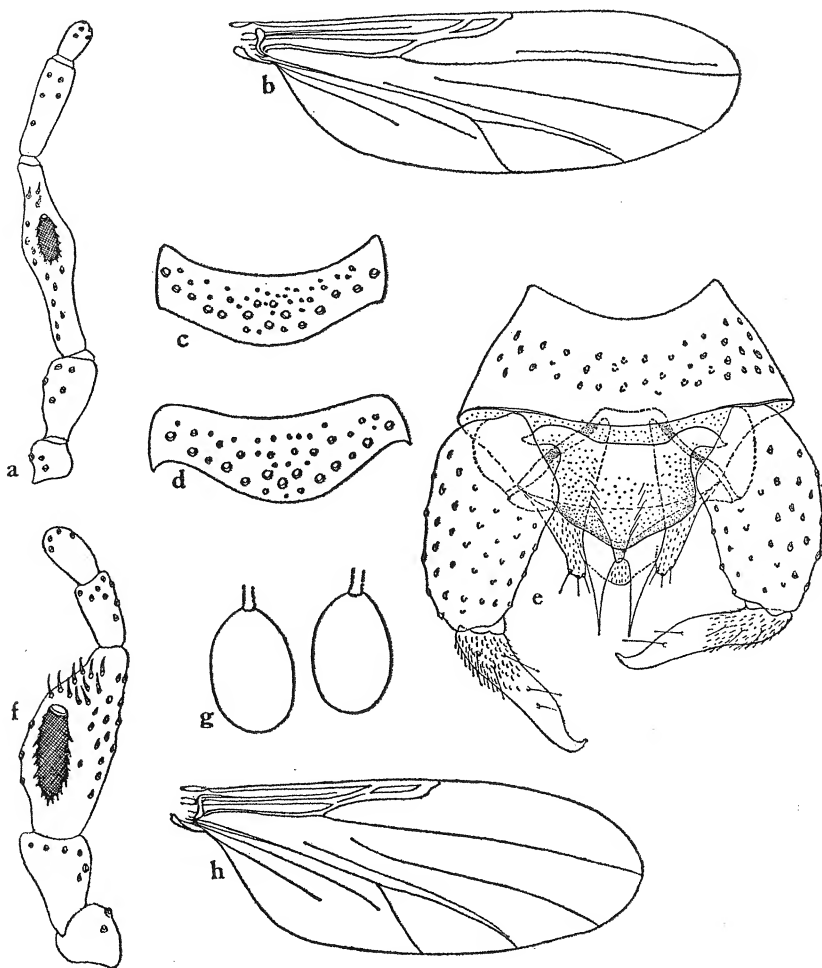


FIGURE 20.—*Forcipomyia* (*Forcipomyia*) *subspadicifascia*. a-c, male: a, maxillary palp; b, wing (hairs omitted); c, scutellum. d, scutellum, female; e, hypopygium, male. f-h, female: f, maxillary palp; g, spermathecae; h, wing (hairs omitted).

areas yellowish. Legs with fore coxae yellowish brown, middle and hind coxae and trochanters brown, other segments yellowish pale brown or mainly yellow, but in middle and hind legs femora with broad dark-brown preapical band and tibiae with small dark-brown sub-basal ring and in fore leg sometimes with obscure small brown ring at femoral preapical and tibial sub-basal part. TR about 0.69 in fore leg, 0.45 in middle leg, and 0.55 (0.53-0.56) in hind leg; leg segments, except for coxae and trochanters, in proportion of 149.5:148.5:40:60:34.5:27:19 in fore leg, 176:179:34.5:75.5:38.5:30:20 in middle leg, and 185.5:182:42:77:41.5:31:20.5 in hind leg; claws rather slender, large, and minutely bifid at tip; scales of legs very slender.

Wing dark gray, with only slender dark scales on costa and radial cells. Venation: Costa ending slightly beyond middle of wing (55.3:101) and slightly produced beyond tip of  $R_s$ ,  $R_s$  about half as long as  $R$  and about twice as long as  $R_1$  (15.7:29.7:8.3), second radial cell slightly longer than stem (30.5:25.5), first cell absent,  $M_{1+2}$  and bases of  $M_1$  and  $M_2$  atrophied, stem of fMCu about 1.5 times as long as  $R$  (43:29.7), fMCu slightly beyond tip of  $R_1$ , tip of  $Cu_1$  far beyond level of costal tip. Haltere yellowish pale brown or yellow.

Abdomen almost uniformly brown. Hypopygium dark brown, with styles black, aedeagus and parameres brown. Sternite 9 with caudal width about 1.7 times of basal width and 3.4 times length, its caudal margin slightly and evenly convex at middle; tergite 9 somewhat triangular, bluntly ended at caudal end. Coxites far beyond caudal tips and 1.7 times as long as basal width (57.3:33); styles far shorter than coxites (45.7:57.3), beak-like, basal two-thirds almost straight and not tapered, distal one-third tapered and curved mesad at tip. Aedeagus very broad, wider than long (34:30), its caudal tip somewhat slender, small, not beyond caudal end of tergite 9, its basal angles stout and extended laterad; median lobes of parameres broad, their basal two-thirds fused, separated apical parts sharply pointed and far beyond caudal tip of tergite 9, broadest part just beyond middle of median lobes; lateral arms of paramere very slender, divergent caudad from common base of median lobes, and about twice as long as extreme basal width of common base of median lobes.

*Female:* Body length about 1.85 (1.56-1.95) mm. Wing about 1.19 (1.13-1.24) mm. by 0.47 (0.45-0.49) mm.

Head entirely dark brown including mouthparts; clypeus with six or seven setae. Maxillary palp stout; segment 3 swollen ventrad at middle, gradually narrowed apically, with large sensory pore at middle, and scattered trichoid sensillae on mesal side of distal one-third; five segments in proportion of 10:15.8:32.5:13.8:9.1. Antenna brown; basal short flagellar segments subspherical and each with pair of slender sensillae; AR about 1.42 (1.34-1.62); distal eight segments in proportion of 11.3:11.5:11.8:24.1:24.8:26:25.6:35.5.

Thorax mainly dark brown to brown; scutum somewhat paler on central part; scutellum with 11 strong bristles and five smaller setae along caudal margin and about 23 small setae on anterior half. Legs mainly yellow or yellowish pale brown, but fore coxa and trochanters pale brown, middle and hind coxae dark brown, middle and hind femora with dark-brown, broad preapical band and middle tibia with small sub-basal brown spot or band; female rarely with brown obscure cloud on sub-basal part of fore tibia or without brown spot on middle tibia; fore femur and hind tibia always without dark or brown bands; legs with narrow scales and slender claws. TR about 0.64 in fore leg, 0.45 in middle leg, and 0.49 (0.45-0.52) in hind leg; leg segments in proportion of 125:134.8:38:60:29.8:22.5:19.8 in fore leg, 146.3:173:32.5:73:31.8:24.6:19.8 in middle leg, and 156.8:162.8:38:77.5:35.8:28.5:19.5 in hind leg.

Wing broadest at middle part, with dark-gray hairs, wing bases yellowish, costal and radial veins with shaggy black scales. Venation: Costa very slightly produced beyond tip of  $R_s$  and ending little beyond middle of wing (48.3:87.1),  $R_s$  about twice as long as  $R_1$ , about 0.8 as long as  $R$  (18.5:9.6:23), and obliquely truncate at tip, second radial cell longer than stem (31:27) and rather narrow, first radial cell slit-like,  $M_{1+2}$  shorter than r-m, base of  $M_2$  narrowly atrophied, fMCu at or just beyond tip of  $R_1$ ,  $Cu_1$  ending under or just beyond level of tip of  $R_s$ . Haltere pale brown to brown.

Abdomen dark brown, with thick vestiture of dark scales on tergal and pleural sides, sternites complete with very sparse scales and thick slender dark hairs; cerci yellow; two spermathecae subequal, short oval, brown, 19 by 13.3 units and 18.3 by 12.8 units, their chitinized ducts almost absent.

Holotype, female (US 64027), Agric. Exper. Sta., Colonia, Ponape, 16 m., light trap, Jan. 11, 1953, Gressitt. Allotype, male (US), Mt. Temwetem-wensekir, Ponape, light trap, Jan. 15, 1953, Gressitt.

Paratypes:

Palau. Two females, northeast Koror, Dec. 14, 1952, Gressitt; female, Koror, Jan. 1948, Dybas; three females, Ngarmalk, light trap, Dec. 12, 13, 1952, Gressitt; two females, Mt. Amiangal, Peleliu, light trap, Dec. 22, 1952, Gressitt.

Ponape. Two males (BISHOP), same data as for allotype.

Kusaie. Female, Mutunlik, light trap, Mar. 30, 1953, Clarke.

Marshall Is. Female, Majuro Atoll, June 27, 1950, La Rivers; female, Namu Atoll, Namu I., Oct. 24, 1953, Beardsley.

Other specimens:

Palau. Four females, Ngaremlengui, Babelthuap, at light, June 1-2, 1957, Sabrosky; 11 females, Koror, at light, Apr. 18-July 26, 1957, Sabrosky.

Yap. Female, Dugor District, Weloy, Yap, May 6, 1957, Sabrosky; female, Tomil District, Gagil-Tomil, July 8, 1950, Goss.

Caroline Atolls. Female, Nama, Feb. 15-16, 1949, Potts.

Kusaie. Female, Pukusrik, at light in mangrove wood, Apr. 2, 1953, Clarke; female, Mutunlik, Mar. 21, 1953, Clarke; female, Hill 541, 150 m., Mar. 11, 1953, Clarke.

DISTRIBUTION: Caroline Is. (Palau, Yap, Nama, Ponape, Kusaie) and Marshall Is.

The male of this species closely resembles that of a new Micronesian species, *F. flavitibialis*, in the structure of the hypopygium, but the median lobes of parameres of these two species are distinctly different in shape, as shown in the figures and in the key to the species. The female is similar to *flavitibialis* in the coloration and to *F. esakiana* Tokunaga in the structure of the maxillary palp, spermathecae, and other main structures, but in *flavitibialis* the maxillary palp, spermathecae, and wings are different in shape from this species and in *esakiana* the coloration, especially that of the hind legs, is different. The species name is related to the brownish bands of the femora and tibiae, the arrangement of which is one of the important specific characters.

20. *Forcipomyia* (*Forcipomyia*) *flavitibialis* Tokunaga and Murachi, n. sp. (fig. 21).

Dark-brown, rather large; legs mainly yellow or yellowish pale brown; middle and hind legs with distinct preapical dark-brown band on femur, tibiae without or with obscure sub-basal brown bands. In female, antennae yellow and brown, basal short flagellar segments 2 to 9 yellow, segment 3 of maxillary palp strongly swollen ventrad and suddenly

narrowed apically, scutum somewhat yellowish on middle part, middle and hind femora with broad dark-brown preapical band, bands subequal to each other, usually about half as long as the femur, and sometimes smaller, tibiae usually without brown bands but middle tibia sometimes with obscure small brown cloud on sub-basal part, wing with many dark shaggy scales on costa and radial veins, broadest part far before middle of wing, and second radial cell rather large. In male, scutum obscurely yellowish on median area, middle and hind legs with femoral dark bands equally small and tibial brown sub-basal bands equally obscure or small, abdomen with intersegmental yellowish bands and yellowish median parts on basal tergites, hypopygium with median lobes of parameres fused on basal part, which is less than half of length of lobes.

*Female*: Body length about 2.21 mm. Wing about 1.30 mm. by 0.51 mm.

Head and mouthparts uniformly brown; clypeus with about seven setae. Maxillary palp with segment 3 very large, strongly swollen ventrad, suddenly narrowed at tip, with

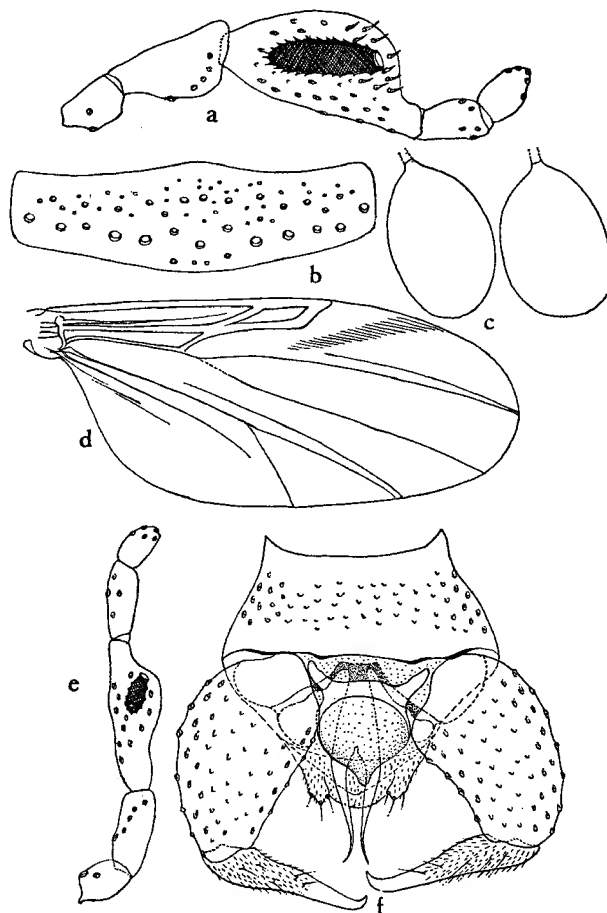


FIGURE 21.—*Forcipomyia* (*Forcipomyia*) *flavitibialis*. a-d, female: a, maxillary palp; b, scutellum; c, spermathecae; d, wing (hairs omitted); e, f, male: e, maxillary palp; f, hypopygium.

apical part very short and sensory pore very large; five segments in proportion of about 11.5:18.3:36:13.3:11.8. Antenna with scape dark brown, basal short flagellar segments 2 to 9 yellow and five apical segments brown; AR about 1.83 (1.73-1.95); proportion of distal eight segments about 10.6:10.8:12:28.9:31.4:31.1:31.8:39.3; segments 2 to 5 somewhat discoidal, shorter than wide, segments 6 to 7 subspherical, segments 8 to 9 slightly longer than wide, segments 10 to 14 elongate and cylindrical.

Thorax uniformly dark brown, but usually broad lateral parts of scutum and median part of anterior half of scutum yellowish brown; scutellum with 13 strong bristles and usually four small median setae along caudal margin and about 40 to 50 minute or small setae on anterior half. Legs with narrow scales on entire length, mainly yellow, with broad dark-brown band on middle and hind femur which usually occupies about distal one-half except for extreme yellowish tip; middle and hind coxae and all trochanters pale brown, all tibiae yellow but sometimes middle tibia with obscure small sub-basal brown cloud; claws slender; TR about 0.62 in fore leg, 0.44 in middle leg, and 0.52 (0.49-0.54) in hind leg; leg segments, except for basal two, in proportion of 145.3:153.3:43:69.8:36:27.5:22.3 in fore leg, 173:189.5:37:84.5:38.3:28.8:22 in middle leg, and 182.3:184:45.3:87.8:43.8:32:22.3 in hind leg.

Wing uniformly dark, with dark vestiture of hairs and shaggy black scales on costa and radial veins, broadest before middle of wing. Venation: Costa slightly produced beyond tip of Rs and ending slightly before middle of wing (59.3:104), Rs about twice as long as R<sub>1</sub> and about four-fifths of R (20.5:10.7:26.3), second radial cell truncate obliquely at distal end, rather large and longer than stem (41.3:34.7), first cell obliterated, r-m longer than M<sub>1+2</sub>, base of M<sub>2</sub> obscure, fMCu under or just beyond tip of R<sub>1</sub>, tip of Cu<sub>1</sub> under costal end. Haltere yellow.

Abdomen dark brown; tergites and pleural membranes with dark-brown, narrow scales, integument with many short, wavy, pale patterns at bases of scales; sternites not reduced, brown, with dark-brown hairs and narrow scales; cerci yellow; two spermathecae oval, subequal, brown, 22.7 by 17.5 units and 23.3 by 15.2 units, with very short chitinized ducts.

*Male:* Body about 2.31 mm. long. Wing about 1.38 mm. by 0.41 mm.

Head dark brown including mouthparts; clypeus with several setae; proboscis slightly shorter than one-half of height of head capsule. Maxillary palp rather slender, segment 3 with middle part swollen ventrad and both ends slender, sensory pore on distal half; five segments in proportion of 9.7:17.9:30.7:12.9:10.7. Antenna entirely dark brown including plumose hairs, with segments 2 to 10 and 11 to 14 in proportion of 151.4:164.5; distal eight segments in proportion of 14.6:15:15.6:16.6:54.4:39.6:31.4:40.4.

Thorax brown; scutum with pair of subconfluent, yellowish median vittae; scutellum with 11 or 13 strong bristles and three or five small setae along caudal margin and many small or minute setae on anterior half. Legs with coloration generally similar to those of female, but middle and hind femoral preapical dark-brown bands much smaller, and middle and hind tibiae with sub-basal small brown bands, sometimes obscure; claws large, slender and strongly curved; TR about 0.55 in fore leg, 0.35 in middle leg, and 0.47 (0.43-0.5) in hind leg; distal seven leg segments in proportion of 146:152.1:40.4:74:39:30.4:21 in fore leg, 169.4:182.3:31.1:90:44:32.9:20.7 in middle leg, and 179.7:182.1:39.9:86.7:46.6:35.7:21 in hind leg.

Wing with gray hairs. Venation: Costa slightly produced beyond tip of Rs and a little beyond middle of wing (55.4:105.8), Rs obliquely curved toward costa at end, about 1.5 times as long as R<sub>1</sub>, half of R, or one-third as long as stem of fMCu (15:9.8:30.3:44.8), second radial cell short, subtriangular and much shorter than stem (23.5:35.3), second radial cell absent, fMCu just before level of tip of Rs but rarely under costal end. Haltere pale brown.

Abdomen dark brown, with intersegmental yellow bands and basal tergites with median, broad yellow stripe, narrow scales present on tergites. Hypopygium entirely dark brown; sternite 9 narrow basally, broad apically, caudal width about 2.3 times median length, caudal margin with transverse ridge at middle; tergite 9 somewhat triangular and



caudal margin indistinct. Coxites beyond caudal tip of tergite 9, tapered slightly, and about 1.7 times as long as basal width; style slightly shorter than coxite (35:45), beak-like, and with slightly curved pointed tips. Aedeagus broad, somewhat chestnut-shaped, with shoulder parts obtuse, caudal median projection small and blunt, basal angles rather slender and produced laterocephalad. Parameres with two basally fused median lobes and slender lateral arms; median lobes fused on basal three-sevenths (17.1:39.6), middle broadest part about three times basal narrow part, separated parts of lobes sharply pointed and extending caudad as long as coxites, basal arms slender, about half as long as median lobes, and median connection of arms short and straight.

Holotype, female (US 64028), Mt. Temwetemwensekir, Ponape, 180 m., light trap, Jan. 17, 1953, Gressitt. Allotype, male (US), Koror I., Palau, at light, Apr. 14, 1953, Beardsley.

Paratypes:

Guam. Female (HSPA), Piti, Aug. 9, 1936, Swezey.

Palau. Two males, Ulimang, Babelthuap, Dec. 15, 1947, Dybas; male, Ngiwal, Babelthuap, July 21, 1946, Townes; male, east Ngatpang, Babelthuap, 65 m., light trap, Dec. 10, 1952, Gressitt; male, Koror, Nov. 30, 1947, Dybas; female, Koror, 60 m., Mar. 15, 1948, Maehler; four males, Koror, at light, Apr. 14, 1953, Beardsley; female, three males, southwest Koror, 25 m., light trap, Dec. 5, 11, 14, 1952, Gressitt; male, Mt. Amiangal, Peleliu, light trap, Dec. 22, 1952, Gressitt.

Yap. Male, near Yaptown, Yap I., July 14, 1946, Townes; male, Yap I., July-Aug. 1950, Goss.

Caroline Atolls. Two females, Ifaluk I., Ifaluk Atoll, Aug. 2, 1953, Bates; male, Elato, Feb. 4, 1953, Beardsley; female, Nukuoro, Aug. 6, 1946, Townes; two females, 13 males, Hare I., Kapingamarangi, Aug. 3, 1946, Townes; male, Matiro I., Kapingamarangi, Aug. 4, 1946, Townes.

Truk. Male, Wena (Moen), 180 m., July 31, 1946, Townes; three females, Mt. Chukumong, Wena, 80 m., Feb. 6, 1953, Gressitt.

Ponape. Female (MCZ), Agric. Exper. Sta., Colonia, June-Sept. 1950, Adams; female, south of Nanpohnmal, Jan. 17, 1953, Clarke; eight females, 13 males (BISHOP), Mt. Temwetemwensekir, 180 m., light trap, Jan. 15-19, 1953, Gressitt.

Kusaie. Ten females, 12 males, Mutunlik, 22 m., light trap, Jan. 23, 24, 1953, Gressitt; three females, five males, Mutunlik, light trap, Mar. 21, 25, 30, 1953, Clarke; female, nine males, Mutunlik, Apr. 3, 30, 1953, Clarke; three females, Pukusrik, Apr. 2, 1953, Clarke; male, Hill 541, light trap, Mar. 25, 1953, Clarke; two males, Mwot, light trap, Mar. 10, 1953, Clarke; female, Hill 1010, light trap, Mar. 13, 1953, Clarke; female, Mt. Buache, Aug. 19, 1946, Townes.

Marshall Is. Two females, Bikajela I., Ailinglapalap, Aug. 25, 1946, Townes; two females, Arno I., Arno, Oct. 4, 1953, Beardsley.

Other specimens:

Palau. Two males, Ngerehelong, Babelthuap, May 7, 1957, Sabrosky;

seven females, Ngiwal, Babelthuap, May 19, 1957, Sabrosky; six females, two males, Ngaremlengui, Babelthuap, at light, June 1-2, 1957, Sabrosky; eight females, Koror, at light, Apr. 17-May 30, 1957, Sabrosky; three females, Koror, July 24, 1957, Sabrosky; female, Peleliu, light trap, May 20, 1957, Sabrosky.

Yap. Seven females, Rumung, Aug. 9, 1950, Goss; female, Weloy, Dugor Distr., June 1957, Sabrosky; female, southwest Yap, July 14, 1950, Goss.

Gilbert Is. Female, male, Butaritari I., Butaritari A., Dec. 1957, Krauss.

DISTRIBUTION: Mariana Is. (Guam), Caroline Is. (Palau, Yap, Truk, Ponape, Kusaie), Marshall Is., Gilbert Is.

This species is closely allied to *F. ornata* Tokunaga, especially in the structure of the female, except for the different coloration of the legs, but the male shows a quite different shape of the median lobes of the parameres. Another allied species may be *F. subspadicifascia*, distinctive from the present species as shown in the key. This species is thought to be abundant in the Caroline Islands and is widely distributed in Micronesia.

## 21. *Forcipomyia* (*Forcipomyia*) *tuthilli* Tokunaga, n. sp. (fig. 22).

Small or medium-size yellow and brown or dark-brown; coloration and general structure closely allied to *F. flavitibialis* Tokunaga and Murachi. Segment 3 of female maxillary palp very thick, suddenly narrowed at tip, with very large sensory pore, and scattered spoon-like sensillae. Basal short flagellar segments of female antenna yellow, slightly flattened basally and spherical or short-oval apically; AR about 1.69. Thorax yellowish, scutum fuscous on shoulder parts and lateral margins, scutellum and postscutellum dark. Legs almost entirely yellow, but hind femora with more or less distinct dark bands on pre-apical parts and middle coxae somewhat fuscous. TR of hind leg about 0.5 in male and 0.59 in female. Wing with dark dense scales on costal and radial veins, other macrotrichia and scales on veins pale, costa extending little beyond middle of wing, first radial cell slit-like, second cell as long as first in female and one-half of first in male; female wing with widest part at level of second radial cell. Female abdomen with dense scales on tergites and pleural membranes; cerci yellowish white; two spermathecae, slightly unequal, and subpyriform. Male hypopygium with styles very slightly undulate and slender; aedeagus broad and with tiny caudal process; parameres with median caudal lobes rather slender, basally fused less than one-half of total length.

*Male*: Body length about 2.19 (2.05-2.28) mm. Wing about 1.29 (1.21-1.33) mm. by 0.39 (0.38-0.4) mm. Legs, wings, and abdominal tergites with slender scales, setae and bristles of various parts of body almost yellowish.

Head mainly dark brown or brown, with eyes broadly contiguous above, proboscis about half as long as head capsule (15:30.5), clypeal setae 7 or 8. Maxillary palp rather slender, with five segments in proportion of 9.3:14.5:25.3:12:7.6, segment 3 swollen ventrad just beyond middle and with oval sensory pore in this swelling. Antenna with scape fuscous yellow, other segments and plumose hairs entirely brown; relative length of segments 2 to 10 and 11 to 14 together about 119:132.3, those of distal eight segments about 11.5:11.8:12:14:40:31.3:26.8:34.

Thorax with scutum extensively yellowish brown, but with yellow median vittae incompletely separated and ending at level of scutal sutures, lateral margins and shoulder parts enveloping humeral pits strongly fuscous, sometimes lateral areas between caudoscuteal area and fuscous lateral margins paler; scutellum and postscutellum fuscous brown, former with 11 strong and two smaller bristles along caudal margin; pleural sides extensively yellow, but with several brown sclerites; sternal side yellow. Legs almost entirely yellow,

including setae, bristles and scales, but middle coxae slightly fuscous, hind femora each with rather distinct, broad, dark band on preapical part and rarely this femoral band very much paler; scales of legs one- or two-striped and slender, hind tibial comb usually with eight, and rarely seven, apical bristles, claws slender, as long as empodium and bifid only at tips; hind TR about 0.5 (0.46-0.51); leg segments, except for basal two, about 130.3:130.3:37.8:61.8:33.5:25:20 in fore, 152.3:156.8:28.5:7.5:36.5:28.8:21.3 in middle, and 157:157:37.8:76:40.3:30.5:22 in hind leg.

Wing with dense macrotrichia pale, costa and radial veins with black shaggy scales, veins very pale. Venation: Costa ending just beyond middle of wing (52.3:99), Rs about 1.5 times as long as  $R_1$  (9.8:14.8), first radial cell slit-like, second cell opened, subtriangular and half as long as first cell (4.5:9), R, M, and stem of fMCu in proportion of 28.3:25:41.3, fMCu under second radial cell,  $M_{3+4}$  little longer than twice of Cu, (32.8:14.3). Haltere with stem yellow and knob white.

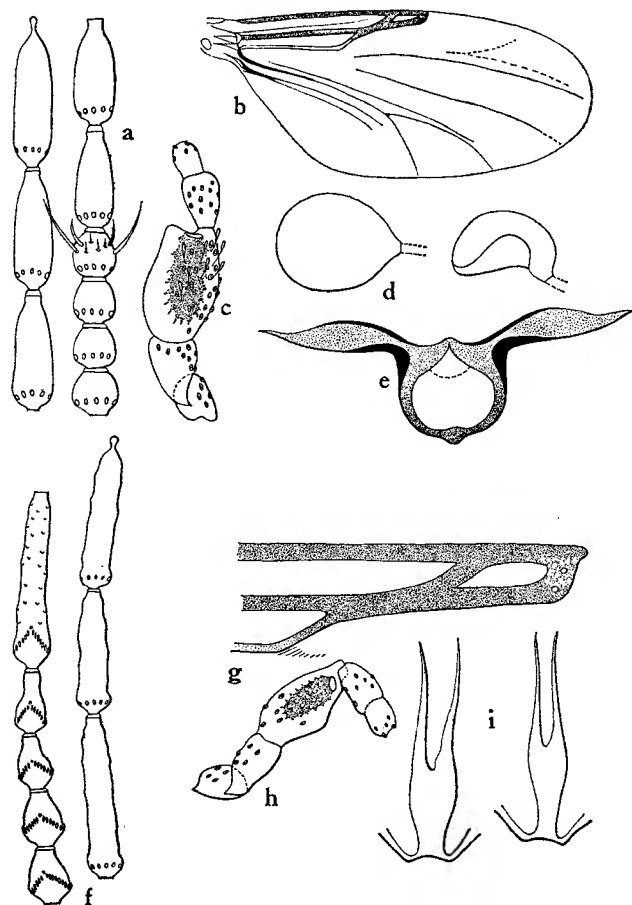


FIGURE 22.—*Forcipomyia* (*Forcipomyia*) *tuthilli*. a-e, female: a, distal nine flagellar antennal segments; b, wing (macrotrichia omitted); c, maxillary palp; d, spermathecae; e, subgenital plate. f-i, male: f, distal eight flagellar antennal segments; g, stigmal area of wing; h, maxillary palp; i, two caudal lobes of parameres.

Abdomen with tergites fuscous brown, but yellowish on middle parts of anterior tergites, intersegmental membranes, pleural sides and sternal side very pale. Hypopygium similar to that of *F. flavitibialis*, dark brown, with sternite 9 short and about half as long as wide (24.5:55), tergite subtriangular and somewhat shorter than wide (41.5:55), coxites conical and about twice as long as basal width (42.3:21.8), styles slender, slightly undulate, tapered, and shorter than coxites (33.5:42.8); aedeagus broad, basal arch rather low, with basal lateral roots slender, median large area broadened caudad (basal and apical width about 17:20.5), round on caudal margin and with small caudal process, total length little shorter than basal width (22.8:26.3) and ending little beyond fused common base of caudal lobes of parameres; parameres slender, basal arms very slender, caudal median lobes about twice length of basal arms (37.8:19.5), slender, about 5.4 times as long as widest part (37.8:7), fused basal part less than half of total length (26.5:37.8).

*Female*: Body length about 2.08 (2.02-2.18) mm. Wing about 1.24 (1.14-1.3) mm. by 0.48 (0.46-0.51) mm. General coloration and structure closely as in male with usual sexual differences.

Head with proboscis little shorter than half of head capsule (15.7:33.7); clypeus with six to nine setae. Maxillary palp stout, segment 3 strongly swollen ventrad, suddenly narrowed apically, with very large sensory pore and many scattered spoon-like sensillae, five segments in proportion of 11.3:15:26.7:12:7.8. Antenna with scape fuscous yellow, basal short flagellar segments yellow, apical elongate ones brown, basal short segments slightly shorter than wide basally and very gradually elongate, segment 8 and 9 little longer than wide or rarely spherical; AR about 1.69 (1.64-1.74); distal ten segments about 8.7:8.8:9:9.3:10:21:23:23.5:25.3:33.7.

Thorax with 13 strong bristles along caudal margin of scutellum. Legs with scales two- or three-striped; hind tibial comb with eight, and rarely nine, apical bristles; claws simple; hind TR about 0.59 (0.56:0.61); relative length of leg segments, except basal two, about 129.3:131:38.7:57:28.7:22:28 in fore, 154.7:165.7:34.7:69.7:31.7:24.3:19.3 in middle, and 169:164.7:44:74.3:36:27:20.3 in hind leg.

Wing oval, with broadest part at middle of wing. Venation: Costa little beyond middle of wing (54.3:95), Rs hardly twice of  $R_1$  (19.3:11.3), R, M, and stem of fMCu about 26:23:39, first radial cell slit-like, second cell rather large, subtriangular, and hardly as long as first cell (8.3:9), fMCu under tip of  $R_1$ ,  $M_{3+4}$  little shorter than twice of  $Cu_1$  (31.7:17.7),  $Cu_1$  ending at level of costal end.

Abdomen with scales dense, two- or three-striped; tergites brown, but middle areas yellowish, with many short, wavy, pale patterns at bases of scales; sternites yellowish, separated into hemisternites, and almost without scales; pleural sides of segments 3 to 7 fuscous and very densely clothed with black scales. Cerci yellowish white; two spermathecae dark, subpyriform, subequal, without chitinized part of duct (20.3 by 14.7 units and 21.3 by 16 units); subgenital plate with basal ring very slender and dark, caudal parts rather broad and yellow.

Holotype, male (US 64589), Jobtan I., Eniwetok A., Ralik Chain, Marshalls, Aug. 30, 1956, Tuthill. Allotype, female (US) with holotype. Paratypes: Seven females, 76 males (AEC Lab., BISHOP), Jobtan I., Eniwetok A., Marshall Is., light trap, Aug. 29 to Sept. 1, 1956, Tuthill.

DISTRIBUTION: Marshall Is. (Eniwetok A.).

This species is closely allied to *F. (F.) guamensis* in coloration; but these two species are distinctly different in the structures of male hypopygia, especially in the shape of parameres.

## 22. *Forcipomyia* (*Forcipomyia*) *esakiana* Tokunaga (fig. 23).

*Forcipomyia esakiana* Tokunaga, 1940, Philippine Jour. Sci. 71 (2): 206 (Truk, Kusaie); 1940, Tenthredo 3 (2): 166.

Dark-brown and yellow, moderate size; legs mainly yellowish, fore femur without dark-brown bands, middle and hind legs with distinct dark-brown bands just before and just beyond knee joints, fore tibia with small dark-brown band on sub-basal part. In female, segment 3 of maxillary palp strongly swollen ventrad and gradually narrowed apically; wing brownish gray, with black shaggy scales on costal and radial veins and obscure pale spots covering r-m and adjacent veins and along costal margin of cell  $R_5$ ; two spermathecae, subequal, small, subspherical, with minute chitinized duct. In male, parameres with rather slender median lobes, fusing basally about one-third or more.

*Female*: Body length about 2.24 (2.2-2.7) mm. Wing about 1.4 mm. by 0.55 mm.

Head including mouthparts dark brown; clypeus with six to nine setae; proboscis rather long, longer than one-half of height of head capsule. Maxillary palp stout; segment

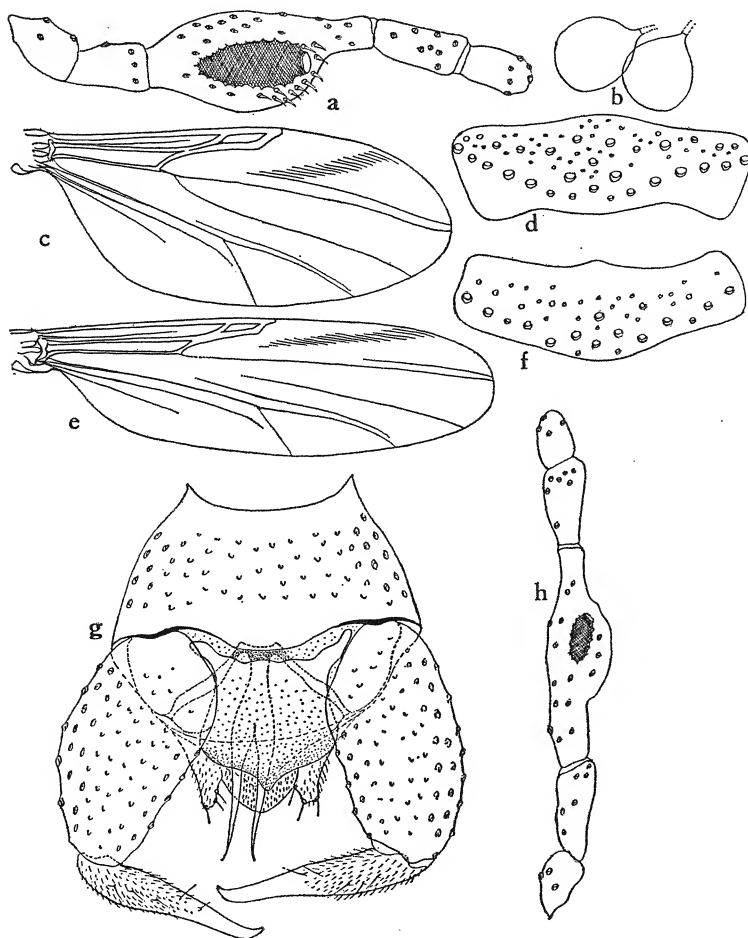


FIGURE 23.—*Forcipomyia* (*Forcipomyia*) *esakiana*. a-d, female: a, maxillary palp; b, spermathecae; c, wing (hairs omitted); d, scutellum. e-h, male: e, wing (hairs omitted); f, scutellum; g, hypopygium; h, maxillary palp.

3 strongly swollen ventrad, gradually narrowed apically, and apical quarter narrower than base, with very large sensory pore on middle part; proportion of five segments about 12:21.5:43.5:17.7:11.3. Antenna with scape and five long distal segments brown; basal short segments 2 to 9 yellowish pale brown and brown on apical tip, more or less longer than wide, and with slender sensillae; AR about 1.28 (1.18-1.49); distal eight segments in proportion of 14:14.5:15:26.4:27.5:26.3:27.8:39.5.

Thorax dark brown, dull, with hairs yellow, pleural membranous area yellow; scutum without distinct paler pattern but somewhat paler along foveae and on caudoscuteal area; scutellum highly setigerous, with 13 or 15 strong bristles and three or five small setae along caudal margin and about 50 small and minute setae on anterior half. Legs mainly yellowish pale brown, with middle and hind coxae brown, trochanters pale brown, fore leg with small dark-brown band on sub-basal part of tibia, middle and hind legs with large distinct dark-brown bands just before and just beyond yellowish knee joints; these femoral and tibial bands sometimes brown; legs with very narrow scales; TR about 0.62 in fore leg, 0.43 in middle leg, and 0.51 (0.47-0.54) in hind leg; leg segments, except for basal two, in proportion of 145.7:159.3:48:73.3:39:29.7:22 in fore leg, 168.7:204:39.7:87:42.7:31.3:21 in middle leg, and 194.7:194:49.7:92.7:47.3:34.7:22 in hind leg.

Wing brownish gray, with dense hairs and shaggy black scales on costal and radial veins; two obscure pale spots, one small, round and covering r-m and adjacent veins and one narrow and along costal margin of cell  $R_5$ . Venation: Costa slightly produced beyond tip of  $R_s$  and ending beyond middle of wing (63.4:109.3),  $R_s$  longer than half of  $R$  and shorter than twice  $R_1$  (17.6:30.3:10.7), obliquely curved toward costa at tip, first radial cell slit-like, second cell rather large and slightly longer than stem (39.5:35), fMCu under or just before tip of  $R_1$ , tip of  $Cu_1$  just under tip of  $R_s$ . Haltere brownish yellow.

Abdomen thickly covered with scales; tergites and sternites not reduced and with dark-brown scales, pleural membranes with black scales; cerci brown; two spermathecae small, subequal, subspherical, about 17.3 by 12.4 units and 15.7 by 11.9 units, with minute chitinized duct.

*Male:* Body length about 2.83 mm. Wing about 1.5 mm. by 0.45 mm. Coloration and structure generally as in female with usual sexual differences, but male somewhat paler.

Head including mouthparts brown; clypeus with five to eight setae; proboscis about one-half as long as height of head capsule. Maxillary palp rather slender; segment 3 strongly swollen ventrad at middle half and narrowed at both ends, but apical quarter more slender than basal quarter, rather small sensory pore situated beyond middle of segment; five segments in proportion of 10.6:18.8:39.4:17:11.5. Antenna entirely brown or dark brown including plumose hairs; segments 2 to 10 and 11 to 14 in proportion of 158.7:177.5; distal eight segments in proportion of 15.8:16.8:17.5:18.8:64.6:43.3:34:42.

Thorax dark brown, with sternal and pleural sclerites brown, membranous areas yellow; scutum with pair of obscurely yellowish subconfluent median vittae and pair of more obscure small yellow short vittae on lateral parts of caudoscuteal area; scutellum with 11 or 13 strong bristles and two or four small setae along caudal margin, strong median bristle and about 25 small or minute setae on anterior half. Legs with narrow scales and claws slender, coloration as in female and fore tibial sub-basal brown band very obscure and usually almost absent; TR about 0.59 in fore leg, 0.36 in middle leg, and 0.44 (0.36-0.54) in hind leg; leg segments in proportion of 106.5:163.2:44.7:79.5:44.3:32.3:21.7 in fore leg, 183.8:199.7:34.8:101.8:49.2:36.5:20.8 in middle leg, and 196.5:200.7:45.5:103.2:53.5:40.3:21.8 in hind leg.

Wing brownish gray, with bases pale brown, dark scales on radial branches and on marginal veins of second radial cell, pale, obscure, round marking covering r-m and adjacent veins, and pale, long marking between costal margin and anterior arm of intercalary vein of cell  $R_5$ . Venation: Costa little produced beyond tip of  $R_s$  and ending just beyond middle of wing (61.8:117.4),  $R_s$  rather short, shorter than half of  $R$  (16:35.6), about 1.8 times as long as  $R_1$  (16:9.6), one-third of stem of fMCu (16:50.2) and obliquely ending toward costa, first radial cell absent, second radial cell rhombic and much shorter than stem (27.8:31.8), fMCu situated usually under tip of  $R_s$ ,  $Cu_1$  ending far beyond level of tip of costa. Haltere brown.

Abdomen dark brown and yellow, with many slender scales, tergites mainly dark brown and with intersegmental yellow bands, basal four or five tergites with median yellow stripes confluent with yellow bands. Hypopygium dark brown; tergite 9 narrowed basally, about two-thirds as broad as caudal width (42:68) and about half as long as caudal width (33:68), median part of caudal margin produced slightly; tergite 9 subtriangular and blunt at caudal tip. Coxites far beyond tip of tergite 9 and about 1.8 times as long as basal width (50:28.5); styles little shorter than coxites (41:50), beak-like, almost straight, tapered gradually, and slightly curved at pointed tips. Aedeagus broad, shoulder parts produced and obtuse, with median caudal projection minute and blunt, basal angles rather slender and produced laterocephalad; parameres with two median rather slender lobes and slender basal arms, median lobes basally fused, fused part about 0.38 as long as total length (16:42.6), shorter than one-half, separated parts of median lobes slender, sharply pointed, extending caudad far beyond tip of tergite 9, median lobes with broadest part slightly before middle and about twice as wide as narrowest basal part (8.1:4.1), basal arms about half as long as median lobes (20:41) and about 2.5 times as long as median width between arms (20:8).

DISTRIBUTION: Caroline Is., Mariana Is., Marshall Is.

S. MARIANA IS. GUAM: Pt. Ritidian, five females, light trap, Aug. 1945, Gressitt; Pt. Oca, two males, light trap, June 1945, G. Bohart and Gressitt; Piti, female, Sept. 1936, Swezey.

PALAU. BABELTHUAP: Two females, Dec. 1947, Dybas; Ngerehelong, two females, two males, May 1957, Sabrosky; Ulimang, two females, male, Dec. 1947, Dybas; Ngaremeskang, 25 m., female, Dec. 1952, Gressitt; Ngaremlengui, 45 females, 124 males, light trap, June 1957, Sabrosky; Melekeiok, female, two males, May 1957, Sabrosky; Imeliik, six females, two males, June 1957, Sabrosky; Airai, female, May 1957, Sabrosky. KOROR: Seven females, five males, Nov.-Dec. 1947, Dybas; 26 females, 33 males, light trap, Apr.-July 1957, Sabrosky; southwest part, 25 m., four females, eleven males, light trap, Dec. 1952, Gressitt; Ngarbaged, female, Mar. 1938, Murakami; 60 m., female, Mar. 1948, Maehler; female, at light, Nov. 1947, Dybas; female, at light, Apr. 1953, Beardsley. NGARMALK: Male, 25 m., light trap, Dec. 1952, Gressitt. PELELIU: Eight females, 29 males, at light, May 1957, Sabrosky; Mt. Amiangal, male, light trap, Dec. 1952, Gressitt. ANGAUR: Two males, Feb. 1948, Dybas.

YAP. YAP: Hill behind Yaptown, 50-60 m., six females, Nov., Dec. 1952, Gressitt; Colonia (Kolonja), seven females, July-Aug. 1950, Goss; female, two males, June 1957, Sabrosky. GAGIL-TOMIL: Tomil Distr., male, July 1950, Goss; Gagil Distr., female, male, July-Aug. 1950, Goss.

CAROLINE ATOLLS. NAMA I.: Three males, Feb. 1949, Potts.

TRUK. WENA (Moen): Four females, June 1946, Townes; two males, July 1946, Townes. TON: Mt. Unibot, 200 m., two males, light trap, Dec. 1952, Gressitt. PIS: Female, June 1946, Townes.

PONAPE. Agric. Exper. Sta., Colonia, 16 m., two males, five females, light trap, Jan. 1953, Gressitt; Colonia, female, Feb. 1948, Dybas; south of Nanpohnmal, female, light trap, Jan. 1953, Gressitt; Mt. Temwetemwensekir, 180 m., ten females, ten males, light trap, Jan. 1953, Gressitt.

KUSAIE. Mt. Matante, 380 m., female, Apr. 1953, Clarke; Mutunlik, 22 m., male, Jan. 1953, Clarke; Mutunlik, male, Feb. 1953, Clarke.

MARSHALL IS. LIKIEP: Likiep I., two females, Aug. 1946, Townes. AILINGLAPALAP: Near Airok I., five females, Aug. 1946, Townes. EBON: Female, Sept. 1953, Beardsley.

### 23. *Forcipomyia* (*Forcipomyia*) *ornata* Tokunaga (fig. 24).

*Forcipomyia ornata* Tokunaga, 1940, Tenthredo 3 (2): 166 (Palau); 1941, Annot. Zool. Japon. 20 (2): 109.

Dark-brown or brown and yellow, moderate in size, with coloration closely similar to that of *F. esakiana*; legs mainly yellowish, fore legs with narrow dark-brown or brown band on sub-basal part of tibia and middle and hind legs with large dark-brown or brown band on preapical part of femur and small similar band on sub-basal part of tibia. In female, AR about 1.43, maxillary palpal segment 3 very large, strongly swollen ventrad, suddenly narrowed apically, and apical narrow part very short, as long as wide, hind TR about 0.53; wing with dark narrow scales on costal and radial veins; haltere pale brown or yellowish pale brown; abdomen with many dark narrow scales and tergites with many minute, pale, wavy impressions at bases of scales; cerci yellow and spermathecae oval, large, and subequal. In male, segment 3 of maxillary palp rather slender, slightly swollen ventrad at middle, dark-brown bands of middle legs often small, hind TR about 0.43, wing with vestiture similar to female but somewhat paler, abdomen with yellowish inter-segmental bands and yellow median stripe on basal four or five tergites, median lobes of parameres of hypopygium fused only at base.

*Female*: Body length about 2.44 mm. Wing about 1.51 mm. by 0.57 mm.

Head dark-brown including mouthparts, with proboscis fully two-thirds as long as height of head capsule; clypeus with about seven setae. Maxillary palp stout; segment 3 very large, oval, strongly swollen ventrad, suddenly narrowed apically, apical narrow part as long as, or shorter than, width, with large oval sensory pore; five segments in proportion of 13.8:20.3:41.3:22.8:10.3. Antenna with scape and distal five segments brown, basal short segments 2 to 9 oval, more or less longer than wide, pale brown and with narrow apical brownish ring; AR about 1.43 (1.39:1.52); proportion of distal eight segments about 14.3:14.2:16.2:29.8:31.2:29.7:30.8:39.6.

Thorax almost uniformly brown, but scutum darker on foveae of anterior half and humeral margins and pleural membranous areas yellow; scutellum with 13 or 15 strong bristles, about one or three small setae along caudal margin, and about 30 to 40 various setae on anterior part. Legs mainly yellow, trochanters and tarsal segments pale brownish yellow, middle and hind coxae brown, fore leg with narrow sub-basal dark-brown band or small sub-basal brown cloud on tibia, middle and hind legs with broad preapical dark-brown band on femur and a narrower sub-basal dark-brown band on tibia, these bands sometimes paler, being brown; TR about 0.67 in fore leg, 0.43 in middle leg, and 0.53 (0.51-0.59) in hind leg; leg segments, except for coxae and trochanters, in proportion of 153:164:49.7:76.7:39.7:29.7:23.3 in fore leg, 190.7:216.7:40.3:98.3:42.7:31.7:23 in middle leg, and 204:208:51.3:99:47.7:37:24 in hind leg.

Wing with vestiture of brown hairs on membrane and shaggy, dark, narrow scales on costal and radial veins. Venation: Costa slightly beyond tip of Rs and ending slightly beyond middle of wing (65.3:115:6), Rs ending obliquely toward costa, about twice as long as R<sub>1</sub>, and about 0.7 as long as R (23:12:31.5), first radial cell slit-like, second rather large and about as long as stem, fMCu usually before and sometimes under tip of R<sub>1</sub>, tip of Cu<sub>1</sub> ending usually under tip of costa and rarely under tip of Rs. Haltere pale brown and rarely yellowish pale brown.

Abdomen dark-brown, tergites and pleural membranes with dense narrow scales, sternites not reduced and with only ordinary hairs; cerci yellow; spermathecae large, oval, brown, subequal, 25.6 by 16 units and 22.2 by 17.2 units, without chitinized duct.



*Male*: Body about 2.60 mm. long. Wing about 1.36 mm. by 0.41 mm. General coloration and structures as in female with usual sexual differences and different coloration of abdomen.

Head with proboscis about one-half as long as height of head capsule; clypeus with seven to ten setae. Maxillary palp rather slender, with five segments in proportion of 10.3:16.5:36.5:15.3:12.8; segment 3 somewhat swollen on middle one-third, with sensory pore at this part, apical one-third more slender than basal. Antenna entirely brown including plumose hairs; segments 2 to 10 and 11 to 14 in proportion of 158.6:163.7; distal eight segments in proportion of 14.8:15.5:16.4:18.1:56:38.4:29.7:37.

Thorax brown; scutum with pair of obscure, subconfluent, paler median vittae on anterior half; scutellum with 13 or 15 strong bristles along caudal margin and various

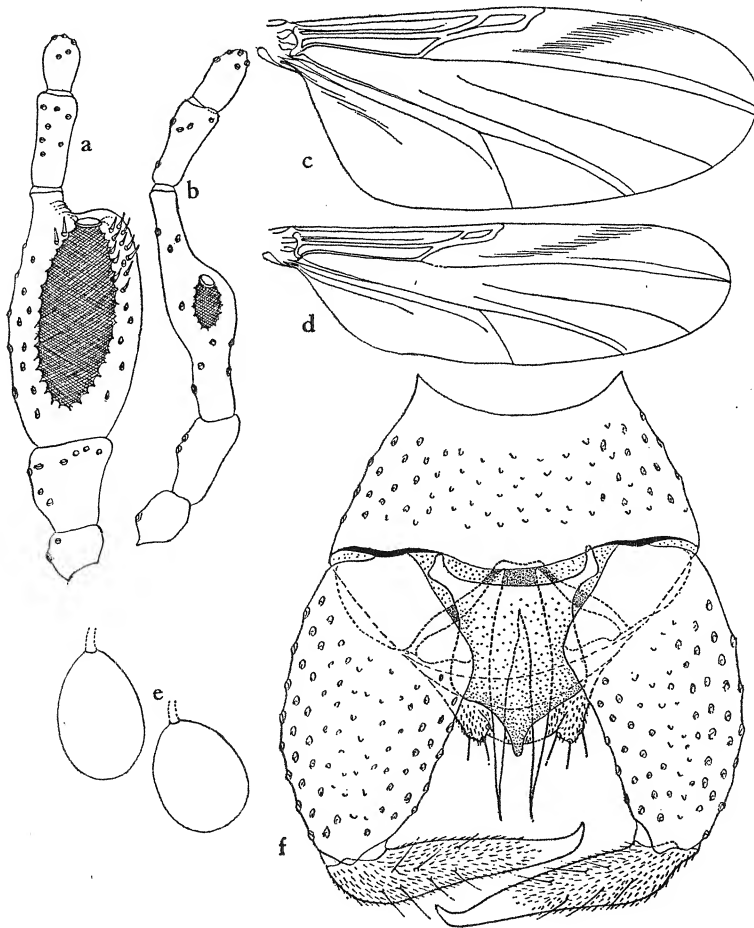


FIGURE 24.—*Forcipomyia* (*Forcipomyia*) *ornata*: a, maxillary palp, female; b, maxillary palp, male; c, wing (hairs omitted), female; d, wing (hairs omitted), male; e, spermathecae; f, hypopygium, male.

setae as in female. Legs mainly as in female, but fore legs usually without sub-basal bands or clouds and middle legs usually with femoral preapical and tibial sub-basal small dark-brown clouds which do not form complete bands or rings; TR about 0.56 in fore leg, 0.35 in middle leg, and 0.43 (0.42-0.44) in hind leg; leg segments, except for basal two, in proportion of 147.4:153.7:41:74.3:42.3:30.7:20.7 in fore leg, 170.7:183.3:30:97.2:45.3:35:21 in middle leg, and 181:180.7:41.3:96.7:50.7:38.3:21 in hind leg.

Wing with dark scales on costal and radial veins and pale brownish-gray hairs on membrane. Venation: Costa produced just beyond end of Rs and ending beyond middle of wing (58:110.4), Rs rather short, about half of R, and about 1.6 times as long as R<sub>1</sub> (16.6:30.3:10.3) and obliquely curved toward costa at tip, first radial cell slit-like, second cell hardly as long as stem or slightly shorter (28.5:31.5) and narrow, fMCu under middle of second radial cell, tip of Cu<sub>1</sub> a little beyond costal end. Haltere pale brown.

Abdomen dark-brown, with yellow intersegmental bands and yellow median vitta on basal four or five tergites; tergites with narrow scales. Hypopygium dark-brown and median lobes of parameres pale brown; sternite 9 with caudal width about 2.5 times as wide as median length; tergite 9 subtriangular and with caudal tip round. Coxites extending far beyond tergite 9 and about twice as long as basal width; style shorter than coxite (39:40), tapered, almost straight, but pointed tips curved. Aedeagus broad, somewhat pentagonal, with shoulder parts obtuse, caudal point extending as far as tergite 9, basal angles rather slender and produced obliquely; parameres with slender median lobes and also slender lateral arms, median lobes fused on basal one-fifth (8:39), separated part sharply pointed and extended caudad far beyond tip of tergite 9; lateral arms of parameres about half as long as median lobes and about 3.5 times as long as fused common basal width of median lobes.

DISTRIBUTION: Caroline Is., Mariana Is., Marshall Is.

S. MARIANA IS. SAIPAN: Male, Dec. 1944, Edgar. GUAM: Pt. Ritidian, six males, light trap, Aug. 1945, Gressitt; female, Aug. 1945, Bohart and Gressitt; Merizo, male, Oct. 1957, Krauss.

PALAU. BABELTHUAP: Ngerehelong Pen., two females, male, May 1957, Sabrosky; Ulimang, female, male, Dec. 1947, Dybas; Ngiwal, 15 females, six males, at light, May 1957, Sabrosky; Ngaremlengui, 140 females, six males, light trap, June 1957, Sabrosky; Ngardok Lake, female, May 1957, Sabrosky; Melekeiok, four females, May 1957, Sabrosky; Imeliik, 11 females, June 1957, Sabrosky; Airai, two females, six males, May 1957, Sabrosky. KOROR: Female, four males, Nov. 1947, Dybas; female, two males, Dec. 1952, Gressitt; male, Mar. 1954, Beardsley; nine females, 19 males, light trap, Apr.-May 1957, 11 females, three males, light trap, July 1957, Sabrosky; southwest part, female, six males, light trap, Dec. 1952, Gressitt. PELELIU: Types taken by Esaki in 1939; 11 females, male, at light, May 1957, Sabrosky.

YAP. MAP: East Map, July-Aug. 1950, Goss. YAP: Ten females, eight males, July-Aug. 1950, Goss; Dugor, male, Aug. 1950, Goss. GAGIL-TOMIL: Gagil Distr., two females, July-Aug. 1950, Goss; Tomil Distr., six females, male, July-Aug. 1950, Goss.

TRUK. WENA (Moen): Six males, 30-120 m., June 1946, Townes. TON: Mt. Unibot, 200 m., male, Dec. 1952, Gressitt.

PONAPE. Agric. Exper. Sta., Colonia, female, two males, Jan. 1953, Gressitt; Mt. Temwetemwensekir, 180 m., male, light trap, Jan. 1953, Gressitt.

KUSAIE. Pukusrik, female, Apr. 1953, Clarke; Hill 1010, 15 females, Apr. 1953, Clarke; Mutunlik, ten females, Jan. 1953, Gressitt; Mutunlik, 22 m., two females, Feb. 1953, three females, light trap, Mar. 1953, Clarke; Hill 541, 165 m., two females, Mar. 1953, Clarke; Mwot, female, Apr. 1953, Clarke.

MARSHALL IS. LIKIEP: Likiep I., five males, Aug. 1946, Townes.

#### Subgenus D

General subgeneric characters closely similar to those of *Forcipomyia* s. str., except for the following points: spermatheca single and second radial cell of female wing rather long. Wing venation somewhat allied to that of *Proforcipomyia*, but it has two spermathecae, unmarked wings and legs and is without scales.

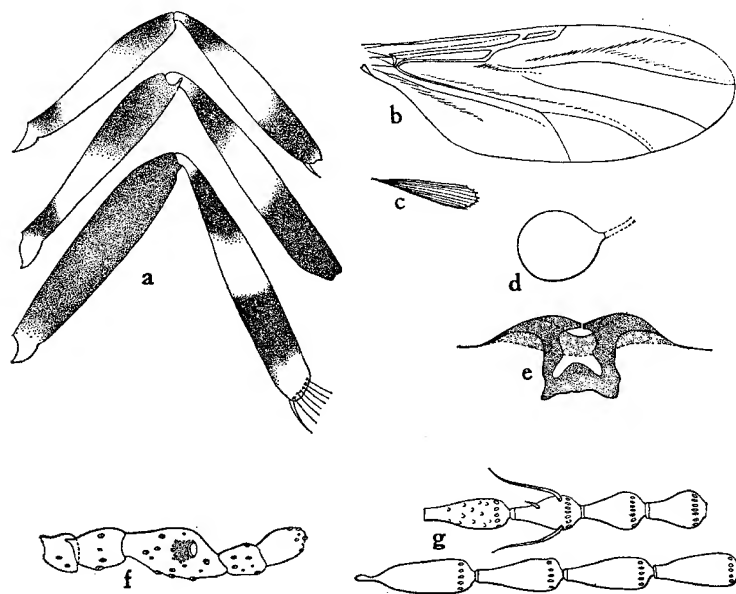


FIGURE 25.—*Forcipomyia* (subgen. D) *unitheca*, female: a, femur and tibia; b, wing (macrotrichia omitted); c, costal scale of wing; d, spermatheca; e, subgenital plates; f, maxillary palp; g, distal eight flagellar antennal segments.

#### 24. *Forcipomyia* (subgen. D) *unitheca* Tokunaga, n. sp. (fig. 25).

Small brown with scales very slender, wings almost entirely dark and legs with two dark bands on tibiae. Female with AR 0.9-0.95, basal short flagellar segments with more or less distinct neck parts, sensory pores of maxillary palp distinct and present at middle or just beyond middle of segment 3, without scattered sensillae. Legs with distinct brown bands on femora and tibiae, somewhat similar to those of *F. penniornata* Tokunaga and

Murachi; female hind TR about 0.79-0.89. Wing of female with dark dense scales on costal and radial veins, without other dark spots or pale spots. One spermatheca only; subgenital plate with subsquare basal ring. Other specific characters as in female of *F. squamianulipes*.

*Male*: Unknown.

Holotype, female (US 64590), east Ngatpang, Babelthuap I., Palau Is., Dec. 7, 1952, light trap at altitude 65 m., Gressitt. Paratypes, Palau: Female, Ngiwal, Babelthuap, light trap, May 19 and 20, 1957, Sabrosky; female, (BISHOP), Ngaremeskang, Babelthuap, light trap, Oct. 24, 1952, Gressitt; 18 females, Melekeiok, Babelthuap, light trap, June 1, 2, 3, 1957, Sabrosky; female, Koror, May 30, 1947, Dybas, and six females, light trap, May 30, 1957, Sabrosky; male, southwest Koror, light trap, Dec. 17, 1952, Gressitt; eight females, Peleliu, light trap, May 28, 1957, Sabrosky. Yap: Male, Yap Hill, Yap, 60 m., behind Yaptown, Nov. 29, 1952, Gressitt.

DISTRIBUTION: Caroline Is. (Palau, Yap).

This species is somewhat allied to Formosan *F. formosae* Kieffer, but they are quite distinctive from each other. Another allied species is *F. penniornata* Tokunaga and Murachi, but this species is different from the present species as stated under the discussion of *F. penniornata*.

### Subgenus *Proforcipomyia* Saunders (1956)

*Proforcipomyia* Saunders, L.G., 1956, Canadian Jour. Zool. 34: 662-663.

Male hypopygium with parameres represented by slender U- or V-shape basal arch arising from basal margins of coxites, without caudal lobes of parameres or only with trace of lobes in a rare case, aedeagus subtriangular, shield-shape and rarely serrate on caudal margin or transverse and band-like. Two spermathecae. Flagellar segments of female antenna more or less differentiated into two groups in shape and size: basal group of eight smaller segments and apical group of five larger ones. TR of hind legs (0.6-2.0). Maxillary palp five-segmented and rarely last two segments incompletely fused; sensory pore of segment 3 usually present and rather small and shallow. Wing rather densely haired with slender macrotrichia, bare areas along veins indistinct; costa reaching middle of wing measured from arculus or slightly more, first radial cell slit-like or absent and second cell subtriangular and not very long or rarely absent. Wings and legs unadorned.

### KEY TO MICRONESIAN SPECIES OF SUBGENUS PROFORCIPOMYIA

1. Male hypopygium with sternite 9 bearing two sharp caudal processes. Female wing without both radial cells. Hind TR about 1.78 in male and 1.89 in female .....26. *bituberculifera*  
Male hypopygium with sternite 9 not bearing caudal processes. Female wing at least with second radial cell. Hind TR less than 1.7..... 2
2. Male hypopygium with caudal lobe of aedeagus serrulate on either side and styles thick and not tapered. Hind TR 1.19 (1.13-1.28) in male and 1.57 (1.44-1.67) in female.....25. *yapensis*  
Male hypopygium with caudal lobe of aedeagus smooth on both sides and styles slender and tapered. Hind TR 0.79 (0.69-0.98) in male and 1.18 (1.05-1.36) in female .....27. *sauteri*

**25. *Forcipomyia* (*Proforcipomyia*) *yapensis* Tokunaga and Murachi, n. sp. (fig. 26).**

Small, brown; scutellum yellowish pale brown or pale brown; legs pale yellowish pale brown, except for coxae, and without dark or brown marking; scutellum with eight strong bristles arranged along caudal margin. Maxillary palp with segment 3 more or less tapered on apical half and last two segments completely or incompletely segmented, in female segmentation of last two more often incomplete; maxillary palp with sensory pore before middle of segment 3 in male and at or just before middle of segment 3 in female. Basal flagellar segments of female antenna slightly transverse, very gradually elongate and short-oval on segment 9. Legs and wings without scales; hind TR of male about 1.19 (from 1.13 to 1.28) and that of female about 1.57; costa of female wing extending slightly beyond middle of wing length and second radial cell of female slit-like. Two spermathecae, unequal and spherical. Arch of parameres slender, widely opened, U-shape, and square on middle part; caudal lobes of parameres absent; aedeagus with apical caudal lobe finely serrulate at both sides; styles rather thick and dark.

*Male*: Body length about 1.66 (1.6-1.77) mm. Wing about 0.92 (0.9-0.94) mm. by 0.27 (0.26-0.29) mm.

Head brown, with mouthparts pale brown; eyes bare and broadly contiguous above. Clypeus with eight or nine setae; maxillary palp with five segments in proportion of 6.8:11.3:22.8:11.3:7.8, segment 3 slender on distal half, slightly swollen on basal half, and with small sensory pore before middle. Antenna all dark brown, including plumose hairs; distal four segments distinctly longer and their proportion to that of preceding nine segments about 92:10.4 (AR about 0.88, from 0.86 to 0.91); distal eight segments in proportion of 10:10:10.5:10.8:32.6:20.8:16:21.7.

Thorax mainly dark brown, with scutellum pale brown or slightly yellowish brown, pleural and sternal sclerites brown, pleural membranes yellow; scutellum with eight strong bristles along caudal margin, three small median setae very closely behind strong bristles and about ten small setae on anterior half. Legs with coxae brown, other segments pale brown, hairs yellowish brown, scales absent; claws slender; TR about 1.52 in fore leg, 1.03 in middle leg, and 1.26 in hind leg; proportion of segments, except for coxae and trochanters, about 104:103:42:29:21:16.5:15 in fore leg, 116:119.5:34.5:33:25:19.3:15.5 in middle leg, and 119.5:113.5:43:36.5:28.5:20.5:15.5 in hind leg.

Wing very pale brownish gray, with hairs and veins very pale brown, without scales. Venation: Costa ending distinctly before middle of wing (32.8:70.8) and not distinctly produced beyond tip of Rs, first radial cell absent, second radial cell somewhat triangular and shorter than its stem (14.3:21), relative length of R, R<sub>1</sub>, and Rs about 14.1:6.3:11.2, fMCu far beyond tip of costa. Haltere brown to pale brown.

Abdomen brown, but ventral and lateral sides paler. Hypopygium brown, sternite 9 somewhat trapezoid, relative width of anterior and posterior margins about 31:41, median part of caudal margin obscure; tergite 9 somewhat triangular but caudal margin round; coxite about 1.5 times as long as width; style slightly shorter than coxite (28:32), not distinctly tapered, but suddenly narrowed on apical one-sixth, and slightly curved at tip. Aedeagus triangular, large, with stout basal lateral angles, apical lobe extending almost as long as coxites, and its lateral sides finely serrulate. Parameres reduced, represented only by pair of narrow basal arms, which connect dorsal basal edges of coxites and consist of short median part and longer, paired lateral parts; median lobes of parameres quite reduced.

*Female*: Body length about 1.33 (1.17-1.43) mm. Wings about 0.81 (0.73-0.9) mm. by 0.33 mm. Coloration generally as in male, but thorax more brownish and scutellum more distinctly yellowish and scutum with humeral parts yellowish and trace of yellowish stripes on foveae.

Head with vertex brown, frons yellow, mouthparts pale brownish yellow; eyes broadly contiguous above, proboscis about half as long as height of head capsule, clypeus with about 12 (10 to 15) setae. Maxillary palp with last two segments often incompletely segmented, segment 3 with rather deep sensory pore just beyond or at middle of segment,

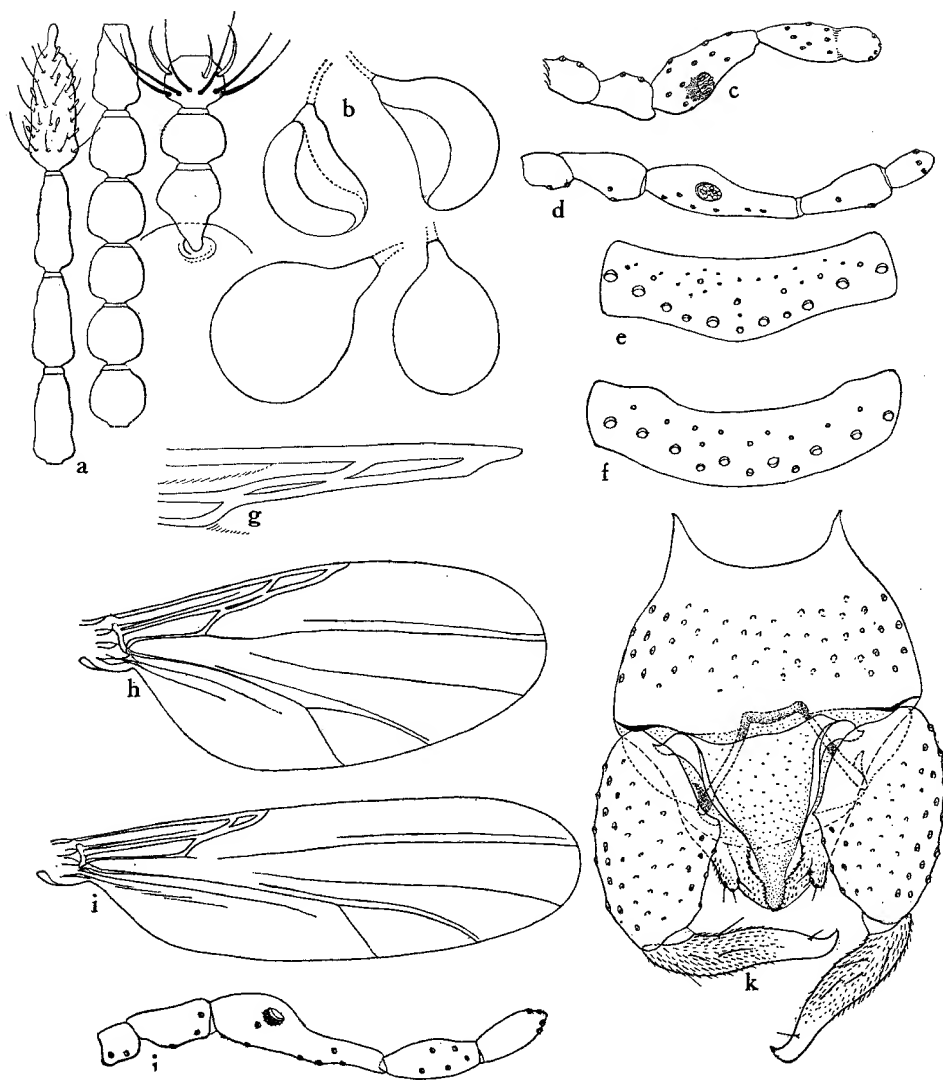


FIGURE 26.—*Forcipomyia* (*Proforcipomyia*) *yapensis*. a-e, female: a, flagellar antennal segments; b, spermathecae; c, maxillary palp (apical two segments incompletely fused); d, maxillary palp; e, scutellum. f, scutellum, male; g, stigmatal area of wing, female; h, wing (hairs omitted), female. i-k, male: i, wing (hairs omitted); j, maxillary palp; k, hypopygium.

five segments in proportion of 7.6:9.9:18.9:10.8:6.7. Antenna entirely brown, with short basal segments discoidal basally and subspherical (very slightly longer than wide) apically; AR about 1.07 (1.01-1.12); apical eight segments about 7.2:7.4:7.9:11.1:11.7:11.9:11.6:18.4 in relative length.

Thorax mainly dark brown, scutum with shoulder parts and slender stripes on foveae yellowish, scutellum yellowish and eight strong bristles along caudal margin and four additional median smaller setae and 16 to 20 much smaller setae on anterior half; pleural and sternal sclerites brown, pleural membranes yellow. Legs almost entirely yellowish; claws moderately thickened and simple, hind legs with TR about 1.57 (from 1.44 to 1.67), and five to six apical bristles of tibial comb; leg segments, except for basal two, in proportion of 87.2:86.8:40.4:21.8:16.1:14.2:14 in fore, 103.4:107.4:35.8:24.6:17.8:14.4:13.4 in middle, and 107.2:102.8:43.8:28.4:20.6:16.6:14.2 in hind leg.

Wing rather broad, very pale brown, with veins pale, no scales. Venation: Costa ending somewhat beyond middle of wing length (35.3:63.1), Rs about twice as long as R<sub>1</sub> (16.1:8.5), first radial cell present and slit-like, second cell subtriangular and about 1.6 times as long as first (5:8), relative lengths of R, M and stem of fMCu about 10:9:25, M<sub>1+2</sub> and basal parts of M<sub>1</sub> and M<sub>2</sub> atrophied, M<sub>3+4</sub> about twice as long as Cu<sub>1</sub> (17.5:9), fMCu below middle of second radial cell or under tip of costa. Haltere pale brown or yellowish pale brown.

Abdomen with tergites brownish and subsquare, sternites paler and reduced, pleural membranes with numerous dark dots at bases of setae; cerci pale brownish yellow. Two spermathecae, brown, round, unequal (2.7+15 by 13.7 units and 4+18.1 by 16.8 units) and each with conical neck part of duct.

Holotype, male (US 64029), Hill behind Yaptown, Yap I., 60 m., Nov. 29, 1952, Gressitt. Allotype, female (US), Pukusrik, Kusaie, light trap, Apr. 3, 1953, Clarke. Paratypes, female (CM), Koror, Palau Is., Jan. 1948, Dybas; female, 12 males (BISHOP), Hill behind Yaptown, Yap, Nov. 28, 29, 1952, Gressitt; female, Pukusrik, Kusaie, light trap, Apr. 3, 1953, Clarke.

Other specimens, Palau: Two females, male, Ngerehelong Pen., Babelthuap I., May 6-8, 1957, Sabrosky; two females, Ngiwal, Babelthuap I., May 20, 1957 and two females, male, June 3, 1957, Sabrosky; male, Ngaremlengui, Babelthuap I., June 1, 1957, Sabrosky; two females, eight males, Melekeiok, Babelthuap I., light trap, May 22, 1957, Sabrosky; nine females, Koror I., Nov. 20 to Dec. 2, 1947, Dybas and male, June 24, 1957, Sabrosky; female, Peleliu I., May 28, 1957, Sabrosky; female, Angaur I., Feb. 5, 1948, Dybas. Yap: Male, Dugor, Yap I., May 14, 1957, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau, Yap, Kusaie).

This species is somewhat allied to *F. simulans* Johannsen from South Sumatra. In *simulans*, however, the female has AR about 1.11, hind TR is about 1.23, the second radial cell of the wing is small and there is a narrow and small whitish spot on the wing at apex of costa, all differing from this species in which AR is about 1.01-1.08, hind TR is 1.54, the second radial cell is rather large, subtriangular, and longer than first cell, and the wings are not provided with pale costal spots. *F. sauteri* Kieffer and *F. nudocula* Tokunaga may be other allied species, except for specific structures of the male hypopygium, but *sauteri* has more distinct yellowish spots and stripes on the scutum and *nudocula* has the AR about 0.95 in male and 1.06-1.1

in female, and the hind TR about 2.0 in male and 2.5 in female, differing from this species.

**26. *Forcipomyia* (*Proforcipomyia*) *bituberculifera* Tokunaga, n. sp. (fig. 27).**

Small, pale brownish; legs entirely yellow or yellowish pale brown and with very slender scales on tarsi. Maxillary palp with segment 3 slender, sensory pore present at middle of segment in both sexes; male antennae with segments 11, 12 and 14 (ultimate) subequal in length and each about twice as long as preceding basal short segment (10) and female antennae with basal short flagellar segments spherical basally and short-oval apically. Thorax almost entirely brownish, scutellum yellowish and with eight strong bristles arranged in line along caudal margin; hind leg with TR about 1.78 in male and about 1.89 in female. Wing very pale brown, without scales, costal vein ending distinctly before middle of wing length, two radial cells obliterated and practically absent. Male hypopygium highly specific in possession of two caudal projections on sternite 9 and transverse aedeagus provided with small triangular median lobe. Two spermathecae, short-oval, unequal and each with short and stout neck part of duct.

*Male*: Body about 1.35 mm. long. Wings about 0.72 mm. by 0.2 mm. Coloration pale brown and yellow mainly.

Head mainly brown, but mouthparts yellowish pale brown, with frontal tubercle oval, eyes broadly contiguous above, proboscis little shorter than half length of head capsule; clypeus with nine setae. Maxillary palp rather slender, segment 3 tapered beyond middle and with small sensory pore just beyond middle. Antenna brown, with segments 11, 12, and ultimate longest, subequal in length to each other, and about twice as long as several preceding short basal segments, 13 only little longer than short basal; relative length of segments 2 to 10 and 11 to 14 taken together about 88.5:60, those of distal eight segments about 8.5:8:8.5:17:17.5:10:16.

Thorax almost uniformly rather pale brown; scutellum with eight strong bristles arranged in line on caudal part and several small setae on middle part. Legs entirely yellow, with claws slender; hind tibial comb with six bristles; leg segments, except for basal two, about 82:82:40:16:14:13:14.5 in fore, 88:95:33:17:16:14:14 in middle, and 90:88:39:20.5:17:15:14 in hind leg in proportion; hind TR about 1.78, from 1.7 to 1.9.

Wing very pale, without scales, with veins faint and bare areas along veins indistinct, entirely hairy. Venation: Costa ending distinctly before middle of wing (24.5:55), relative length of R, M, and stem of fMCu about 10:8.5:28, two radial cells absent and represented by single vein (Rs), which is as long as M (8.5:8.5),  $M_2$  very much obscure, fMCu slightly beyond middle of wing,  $M_{3+4}$  about 2.7 times as long as  $Cu_1$  (19:7),  $Cu_2$  and 1A with distal half completely atrophied. Haltere pale brown.

Abdomen very pale brown, with tergites and sternites highly reduced and without scales. Hypopygium entirely brown; sternite 9 quite peculiar, provided with two spine-like caudal projections slightly arcuate, sharply pointed, arising from caudal margin of sternite and extending as far as tip of median lobe of aedeagus; tergite 9 much broader than long and round on caudal margin; coxites stout, about 1.7 times as long as wide (26:15), almost uniformly setigerous; styles strong, almost straight, fully as long as coxites (27:26), tapered, beak-like and pubescent only on basal part; aedeagus with basal arch very broad and low, with median lobe very small, only half as long as total length and membrane before the arch quite bare; parameres pale brown, somewhat U-shape, flat at middle, divergent caudad, and without free lobes.

*Female*: Body length 1.17-1.2 mm. Wings 0.74 mm. by 0.27 mm. to 0.77 mm. by 0.3 mm. General coloration brown and yellow; wings without scales, legs with two-striped narrow scales on tarsal segments.

Head generally brown, but mouthparts and frons yellowish; clypeus with several scattered setae; proboscis about half as long as height of head capsule (10.5:19); eyes



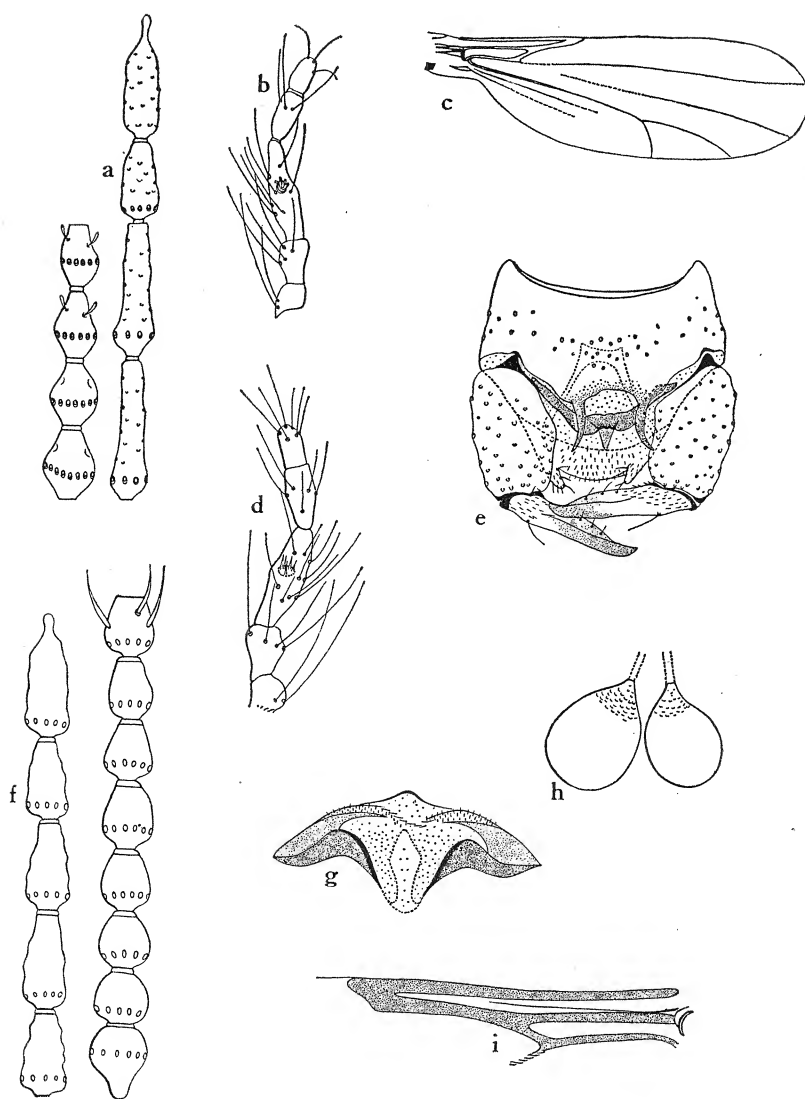


FIGURE 27.—*Forcipomyia* (*Proforcipomyia*) *bituberculifera*. a-c, male: a, distal eight flagellar antennal segments; b, maxillary palp; c, wing (macrotrichia omitted). d, maxillary palp, female; e, hypopygium, male. f-i, female: f, flagellar antennal segments; g, subgenital plate; h, spermathecae; i, stigmal area of wing.

bare and contiguous above. Maxillary palp with segments 4 and 5 incompletely or rather clearly segmented, segment 3 rather slender and its sensory pore small, shallow, with trichoid sensillae located at middle of segment, five segments in proportion of 6.5:9.5:16.3:9:7. Antenna with scape dark brown, other segments and verticils brown, basal short segments spherical and very slightly elongate distally and segments 7 to 9 short-oval, being slightly longer than basal width, segment 10 only 1.25 times as long as 9; AR 0.92-0.94; relative length of segments, except 1, about 8.8:6.5:6.8:7:7.5:7.8:7.9:8:10.5:11:11:10:15.8.

Thorax generally brown, but sternal and pleural sides mainly yellowish, scutellum yellow, scutum with lateral margins and shoulder parts yellow, caudoscuteal area slightly paler, ill-defined narrow stripes on foveae yellowish; scutellum with four median setae, eight strong bristles, and about ten to 12 small hairs on anterior half. Legs entirely pale brownish or yellow, with tarsal scales two-striped and very slender, claws simple and rather slender, empodia normal; tibial comb of hind leg with five or six apical bristles; TR of hind leg about 1.89, from 1.8 to 1.95.

Wing with main veins very pale brown, bare areas along veins not distinct. Venation: Costa not reaching middle of wing length (27.5:58), relative length of R, M, and stem of fMCu about 10.3:8.8:27.5, both first and second radial cell absent, Rs as long as R (10.5:10.3),  $M_2$  atrophied on basal half or more,  $M_{3+4}$  about twice as long as  $Cu_1$  (14:7.5), fMCu far beyond level of costal end. Haltere yellowish brown.

Abdomen with tergites pale brown, sternites almost completely reduced into very pale membranes, pleural membranes slightly fuscous yellow; cerci and last two segments yellowish; spermathecae short-oval, slightly unequal (3.3+17.5 by 15.5 units and 3+16 by 14.3 units), each with short neck part of duct and rough area before duct; subgenital plate highly reduced, represented by pair of curved sclerites, which seem to be separated, and with hyaline body between bases of sclerites.

Holotype, male (US 64591), Koror I., Palau Is., Jan. 18, 1948, Dybas. Allotype, female (US), Koror I., Palau Is., Dec. 2, 1947, Dybas. Paratypes, Palau: Male (CM), Koror I., Nov. 20-30, 1947, Dybas; male, Koror I., May 2, male (BISHOP), Koror I., July 26, 1957, at light, Sabrosky; male, Angaur I., Feb. 5, 1948, Dybas. Ponape: Female, Agric. Exper. Sta., Colonia, Aug. 21, 1950, Adams.

DISTRIBUTION: Caroline Is. (Palau, Ponape).

This species is quite specific in possession of a pair of peculiar thorn-like processes on caudal margin of sternite 9 of the male hypopygium and a narrow transverse band-like aedeagus, differing highly from other species of the genus. The female of the present species is closely similar to that of *F. (P.) yapensis* Tokunaga and Murachi, but, in the allied species, the wing is provided with a well-developed second radial cell and a slit-like first radial cell, the costal vein reaches a little beyond the middle of wing, AR is little larger than 1.0, the legs are not clothed with scales on tarsal segments, TR of hind leg is smaller, being about 1.57, distinctly differing from the present new species.

**27. *Forcipomyia (Proforcipomyia) sauteri* Kieffer (fig. 28).**

*Forcipomyia sauteri* Kieffer, 1912, Suppl. Ent. 1: 27 (Formosa).—Tokunaga, 1940, Tenthredo 3 (1): 83; 1941, Annot. Zool. Japon. 20 (2): 109 (Truk).

Small pale-brown or brown; in female, scutum with yellowish pale-brown marking; maxillary palp slender, with long slender segment 3 and small sensory pore on sub-basal part; antenna mainly brown, with AR about 1.18 in female; legs yellowish pale brown or yellowish brown and without brown or dark bands, TR of hind leg about 1.21 in female and about 0.79 in male; no leg scales; wing yellowish gray, female with two radial cells and male with one radial cell; spermathecae two and slightly unequal; parameres without median lobes and with slender arms and aedeagus somewhat triangular.

*Female*: Body length about 1.52 mm. Wings about 0.94 mm. by 0.39 mm.

Head with vertex brown, frons and mouthparts pale brown, eyes broadly contiguous above, proboscis about two-thirds as long as height of head capsule; clypeus setigerous and with about 14 to 19 setae. Maxillary palp rather slender, segment 3 longest, slightly swollen on basal half, tapered on apical half, and with small sensory pore on basal swollen part, penultimate segment longer than apical; five segments in proportion of 7.2:10:22.1:

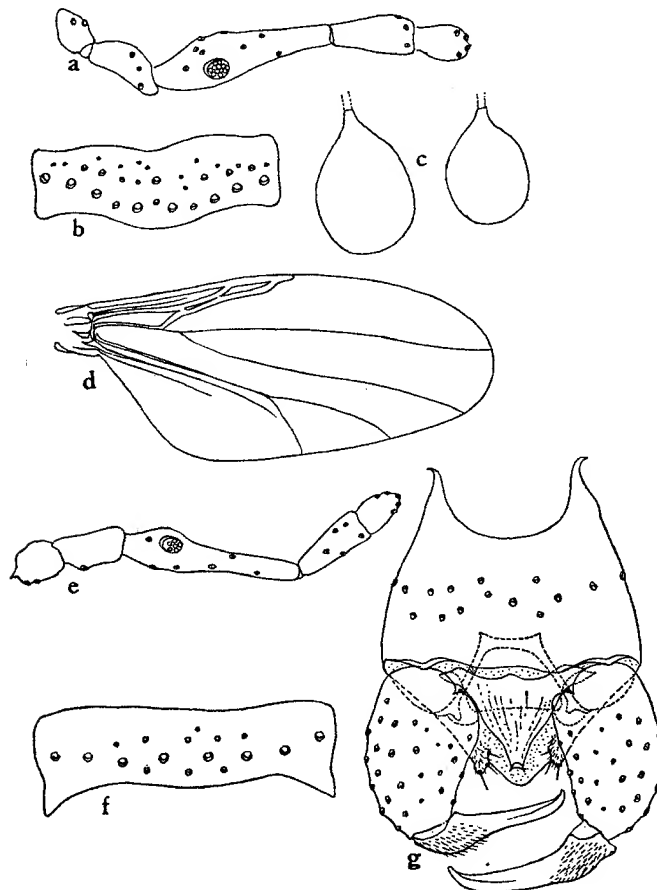


FIGURE 28.—*Forcipomyia* (*Proforcipomyia*) *sauteri*. a-d, female: a, maxillary palp; b, scutellum; c, spermathecae; d, wing (hairs omitted). e-g, male: e, maxillary palp; f, scutellum; g, hypopygium.

13.5:7.5. Antenna with scape brown, other segments somewhat paler than scape; basal short flagellar segments with rather short and almost straight sensillae; segments 3 to 5 somewhat subspherical; segments 6 to 9 somewhat oval; distal five segments cylindrical and long; AR about 1.18 (1.05-1.36); proportion of distal eight segments about 8.2:8.6:9.7:14.3:14.6:14.9:14.9:21.8.

Thorax mainly pale brown on dorsal side and yellowish pale brown on pleural and sternal sides, but scutum with subconfluent yellowish pale-brown marking; caudoscuteal area extensively yellowish and continuous with a pair of yellow spots which cover humeral pits anteriorly by a pair of yellow stripes along foveae, lateral sides yellowish; scutellum almost entirely very pale brown or yellowish pale brown, with eight or ten strong bristles, three or two small setae along caudal margin, and about 20 small minute setae on anterior half. Legs mainly yellowish pale brown, tarsi yellowish brown, with hairs yellow and without scales; TR about 1.51 in fore leg, 1.75 in middle leg and 1.26 (1.14-1.3) in hind leg; proportion of leg segments, except for coxae and trochanters, about 96.7:96.8:42.9:25.9:17.9:15.3:12 in fore leg, 114.3:123.8:37.5:29.4:20.3:15.7:13 in middle leg, and 117.9:114.3:44.3:35.3:24.4:17.3:13.9 in hind leg.

Wing yellowish gray, with veins pale brown, pale brownish yellow hairs, and without scales. Venation: Costa distinctly produced beyond tip of Rs and ending slightly beyond middle of wing (41.5:71.6), Rs far longer than R and about 1.77 times as long as  $R_1$  (18.1:13.5:10.2), obliquely curved at tip toward costa, first radial cell very narrow, second radial cell long, and slightly longer than first (8.4:6.5), fMCu ending slightly or just before tip of Rs, Cu<sub>1</sub> ending just before, under or just beyond, costal tip, r-m a little longer than or subequal to  $M_{1+2}$ . Haltere yellowish brown.

Abdomen with tergites pale brown, sternites yellow, pleural membranes brownish pale fuscous, without scales and with cerci yellowish white; two spermathecae, somewhat pyriform, brown, usually distinctly unequal, 25.5 by 15.4 units and 18.6 by 14 units, chitinized duct almost absent.

*Male:* Body length about 1.88 mm. Wings 1.11 mm. by 0.32 mm. General coloration and structure similar to those of female with usual sexual differences.

Head dark brown, with mouthparts pale or yellowish brown; eyes broadly contiguous above; clypeus with about eight or nine setae. Maxillary palp more slender than in female, with five segments in proportion of 7.4:10.6:25.4:13:7.7. Antenna with scape dark brown, other segments and plumose hairs all brown; proportion of segments 2 to 10, 2 to 11, 2 to 12, 11 to 14, 12 to 14, and 13 to 14 about 132:174.3:205.1:117.8:75.7:45.2; distal eight segments in proportion of 13.1:12.8:13.4:14.2:40.6:30.8:19.3:25.8.

Thorax brown, usually yellowish on lateral and anterior parts, with obscure, narrow yellowish stripes on foveae, without caudoscuteal yellow spot and rarely uniformly brown; pleural membranes extensively yellow; scutellum yellow, with eight strong bristles and three small setae along caudal margin, but rarely ten strong and one small setae, and five to seven small and minute setae on anterior half. Legs slender, almost uniformly yellowish pale brown with claws slender, without scales; TR about 1.2 in fore leg, 0.76 in middle leg, and 0.79 (0.69-0.98) in hind leg; proportion of leg segments, except for basal two, about 112:105.7:42.1:35.5:24.5:18.2:15.2 in fore leg, 124.7:92.7:30.8:40.8:29.5:19:13.8 in middle leg, and 125:117.5:39.5:48:33.8:22.5:15 in hind leg.

Wing pale brownish gray, without scales, with brown hairs on costal and radial veins and yellowish-brown hairs on membrane and other veins. Venation: Costa produced beyond tip of Rs and ending before middle of wing (42:87.6), Rs about 0.67 as long as R and about 1.38 times as long as  $R_1$  (13.1:19.6:9.6), and obliquely curved at tip toward costa, first radial cell absent, second radial cell subtriangular and far shorter than stem (16.2:28.2), fMCu distinctly beyond level of tip of costa. Haltere pale brown or yellowish pale brown.

Abdomen without scales, almost entirely brown and somewhat fuscous, with brown hairs. Hypopygium brown; sternite 9 with caudal part broad, about 1.8 times as broad as median length (43:24) and broad middle part of caudal margin very slightly produced caudad; tergite 9 rather short, triangular, and blunt at tip. Coxites stout, about 1.7 times as long as basal width and usually far beyond tip of tergite 9; styles rather slender, slightly

shorter than coxites (27.6:30.4), tapered, claw-like, very slightly curved, and with pointed tips. Aedeagus triangular, usually lateral sides very slightly shorter than basal width (23.4:24.4) but sometimes far shorter (22:26) and rarely longer (25:23), caudal extreme tip curved ventrad and basal angles stout and pointed laterad; parameres without median lobes, basal arms slender, divergent caudad, basally connected by a similar slender, short bar which is about three-fifths as long as lateral arm.

**DISTRIBUTION:** Formosa, Caroline Is., Mariana Is., Marshall Is., New Guinea (Hollandia, female, May 1945, Hoogstraal).

**S. MARIANA IS. SAIPAN:** Male, June 1951, R. Bohart; Chalan Kanoa, six females, light trap, Jan. 1949, Maehler. **ROTA:** 12 males, June 1946, Townes. **GUAM:** Pt. Ritidian, female, Oct. 1952, Krauss; Agana, two females, Aug. 1952, Krauss; Mt. Lamlam, female, Oct. 1952, Krauss; Yigo, male, Oct. 1957, Krauss.

**PALAU. BABELTHUAP:** Ulimang, male, Dec. 1947, Dybas; Ngiwal, 13 females, 18 males, at light, May 1957, Sabrosky; Ngaremlengui, two females, four males, June 1957, Sabrosky; Melekeiok, three males, May 1957, Sabrosky; Imeliik, female, June 1957, Sabrosky. **KOROR:** Two females, Mar. 1946, Maehler; 16 females, 28 males, Nov.-Dec. 1947, Dybas; three females, Dec. 1953, Beardsley; 24 females, 90 males, light trap, Apr.-May 1957, six females, three males, light trap, July 1957, Sabrosky; southwest part, 25 m., two females, five males, light trap, Dec. 1952, Gressitt. **NGARMALK:** Twenty-five males, light trap, Dec. 1952, Gressitt. **MALAKAL:** Male, May 1957, Sabrosky. **PELELIU:** Female, May 1957, Sabrosky.

**YAP. YAP:** Female, July-Aug. 1950, Goss; Dugor, two females, May 1957, Sabrosky; near Yaptown, four males, July 1946, Townes; hill behind Yaptown, 60 m., four females, 14 males, Nov. 1952, Gressitt; south Yap I., two males, July 1950, Goss. **GAGIL-TOMIL:** Tomil Distr., male, July-Aug. 1950, Goss; Gagil Distr., male, June 1957, Sabrosky.

**CAROLINE ATOLLS. KAPINGAMARANGI:** Hare I., female, two males, Aug. 1946, Townes.

**TRUK. WENA (Moen):** Five males, 30-120 m., June 1946, Townes; 180 m., four males, July 1946, Townes; Mt. Teroken, 150 m., three females, light trap, Dec. 1952, Gressitt. **TON:** Mt. Unibot, 300 m., female, Dec. 1952, Gressitt. **PIs:** Two males, June 1946, Townes. **FEFAN:** Male, Jan. 1953, Gressitt; two females, male, near fresh-water marsh and mangrove swamp, May 1946, Townes.

**PONAPE. Colonia,** female, four males, light trap in cacao grove of Agric. Exper. Sta., Jan. 1953, Gressitt; Exper. Sta., three males, Aug. 1950, Adams; Nanipil, Net Distr., three females, two males, Feb. 1948, Dybas; Mt. Temwetemwensekir, 180 m., female, three males, Jan. 1953, Gressitt.

**KUSAIE. Pukusrik,** male, Feb. 1953, Clarke; Mutunlik, male, Jan. 1953, Gressitt; female, four males, Apr. 1953, Clarke.

**MARSHALL IS. ARNO:** Female, June 1950, La Rivers.

Subgenus *Caloforcipomyia* Saunders (1956)

*Caloforcipomyia* Saunders, L. G., 1956, Canadian Jour. Zool. 34: 680.

Medium-size or small with usually subcutaneous green or blue granules of pigment in fat body. Maxillary palp with last two segments completely segmented or fused and segment 3 with sensory pore or scattered sensillae. Basal flagellar segments of female antennae elongate, two and even three times as long as wide and with slender hyaline sensory hairs as long as segments. Male antenna with segment 11 longest. Legs usually with scales; claws and empodia normal; hind TR 1.3 to 2.33. Wings usually with scales on costal and radial veins, unmarked or adorned with dark and pale spots; costa reaching well beyond middle of wing, second radial cell opened and elongate, first cell slit-like. Two spermathecae. Male hypopygium with parameres V-shape, being pointed at middle, sternite 9 transverse or subsquare and usually without caudal emargination.

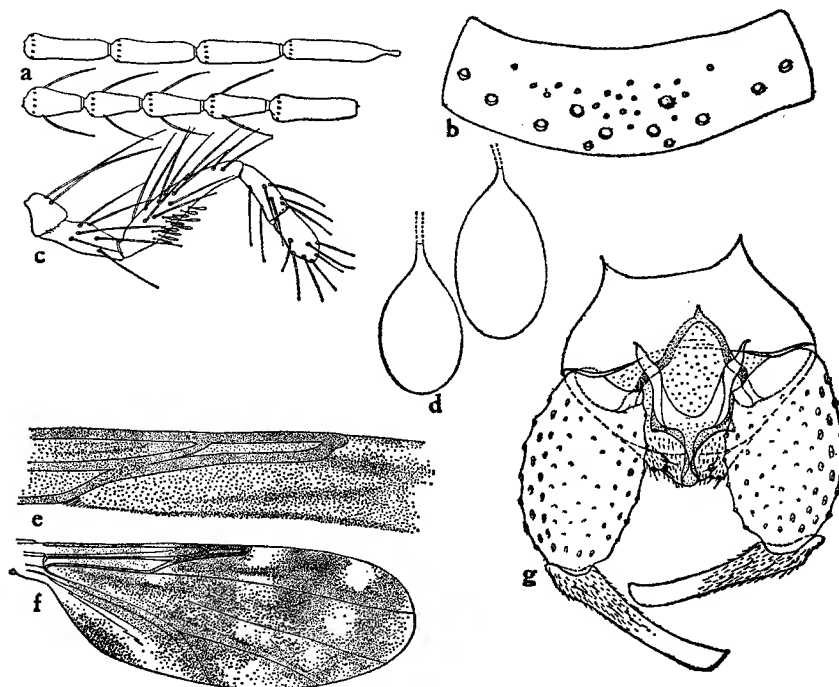


FIGURE 29.—*Forcipomyia* (*Caloforcipomyia*) *squamianulipes*: a, distal eight flagellar antennal segments, female; b, scutellum, male; c, maxillary palp, female; d, spermathecae, female; e, stigmal area of wing, female; f, wing (macrotrichia omitted), female; g, hypopygium, male.

28. *Forcipomyia* (*Caloforcipomyia*) *squamianulipes* Tokunaga and Mura-chi, n. sp. (fig. 29).

Scaly dark-brown or brownish, but male far paler and sometimes yellowish; legs with many broad scales and many dark-brown bands; wings with broad scales on radial and costal veins; antennae brown and yellow. Wing and legs with sexually different coloration. Male wing with mottled marking and legs with very broad, single dark band on each

segment; female wing almost entirely dark and legs with double dark bands on tibiae.

*Male*: Body length about 2.02 mm. Wing about 1.46 mm. by 0.38 mm.

Head pale brown or yellowish brown, including mouthparts; proboscis slightly longer than one-half height of head capsule and with large round labella; clypeus with about 13 setae. Maxillary palp slender, segment 3 especially elongate, slender and without sensory pore and scattered sensillae; five segments in proportion of 10:15:33:12:12. Antenna with scape brown, other segments pale brown or yellowish brown, and tufts of plumose hairs bicolored, yellow on distal half and brown on basal half; segment 11 very long, as long as three preceding or two following segments taken together; proportion of segments 2 to 10 and 11 to 14 about 177-180:207, distal eight segments in proportion of 18:19:21:21.5:78:42:37:49.

Thorax generally yellowish brown or yellowish pale brown, with postscutellum brown, pleural and sternal sclerites pale brown, pleural membranes yellowish white; scutellum with ten strong bristles, and two to four small setae along caudal margin, and ten or more minute setae on anterior half. Legs almost entirely scaly with broad scales, yellowish brown, but dark broad scales forming very large dark bands on middle three-fifths of femora and tibia and at middle of basal four tarsal segments; TR about 2.02 in fore leg, 1.58 in middle leg, and 1.32-1.52 in hind leg; proportion of segments, except for coxae and trochanters, about 170:168:84:40:30:22:16 in fore leg, 167:182.5:88:60:45:31.5:23 in middle leg, and 159.5:163:88.5:56:39:29.5:20 in hind leg; claws rather stout.

Wing with pale brownish-yellow scales, dense dark broad scales on radial cells, and sparse dark scales which form several dark subconfluent patterns: One on sub-basal area, one along marginal area of wing tip, one on intercalary fork in cell  $R_s$ , one on distal three-fourths of vein  $M_{3+4}$ , one on  $Cu_1$ , and one on  $M_{1+2}$  and bases of  $M_1$  and  $M_2$ . Venation: Costa beyond middle of wing (59.5:101),  $R_s$  subequal to half of  $R$  (18:34) and not longer than twice of  $R_1$  (18:10), first radial cell absent, second cell rather large and longer than stem vein (42:30), stem of  $fMc_u$  much longer than  $R$  (44:34),  $fMc_u$  under tip of  $R_1$ , tips of  $R_s$  and  $Cu_1$  at same level. Haltere brown.

Abdomen pale brown, with narrow scales, with indigo-blue pigment under integument. Hypopygium brown, styles yellowish pale brown; tergite 9 subtriangular, with caudal tip round; sternite 9 short, caudal margin about 3.5 times as broad as long, middle part of caudal margin obscure, continuously membranized. Coxite slightly shorter than twice of middle width (54:31.5); styles fully as long as coxites, slender, very slightly curved, with almost same width throughout entire length except for very slightly thickened basal parts, and with blunt tips. Aedeagus with main part subsquare, shoulders pointed, caudal projection narrowed at middle, about three-fourths as long as width of main part, and ending at level of tergite 9; basal angles pointed, rather slender, and directed laterocephalad; basal arch very large and high; parameres large, inverted V-shape, slender, middle angle pointed; median lobes of parameres absent.

*Female*: General coloration and structures closely similar to those of male with usual sexual differences. Body length about 2.46 (2.16-2.71) mm. Wings about 1.58 (1.54-1.64) mm. by 0.56 (0.53-0.58) mm.

Head mainly brown, with eyes contiguous above, proboscis little longer than half length of head capsule (17.9:31.4), clypeus strongly setiferous and with 13 to 20 setae. Maxillary palp slender, segment 3 with scattered sensillae on basal half and five segments with proportion of 11.9:17.7:37.3:14.4:13.1. Antenna with scape brown, flagellar segments slightly paler, two or three basal flagellar segments elongate-oval, about twice as long as wide, following short basal segments gradually elongate, about three times as long as wide and with well-developed neck parts, segments 10 to 13 cylindrical and about four times as long as wide, last segment about five times as long as wide, distal eight segments with proportional length of 20:21:21.7:28.7:29.5:29.3:31:37; AR about 0.89, from 0.86 to 0.93.

Thorax almost entirely brown, scutum with obscure and ill-defined paler areas on foveae and caudoscutal part, scutellum slightly paler and with ten strong and few smaller bristles and about 13 or more minute hairs. Legs mainly dark, thickly scaly with rather broad and four- or five-striped dark scales, which make dark markings, but in all legs

bases of femora and tibiae and all joint parts between tibiae and tarsi and all tarsal segments and entire ultimate tarsal segment pale yellowish; claws simple; TR about 2.02 (1.83-2.13) in fore and 1.55 (1.31-1.74) in hind, hind tibial comb with about four (3-5) bristles. Relative length of leg segments, except for basal two, about 153.1:163.6:96.7:47.7:47.7:33.9:25.7:21.6 in fore, 187.6:216.9:101.9:53.3:38.7:27.7:22.3 in middle, and 197.4:214.7:109:69.6:51:33.4:23.6 in hind leg.

Wing with narrow one- or two-striped scales, two costal dark spots: one covering two radial cells and one covering anterior arm of intercalary fork, and several ill-defined faint pale spots: one covering r-m, one between two costal dark spots, one beyond apical dark spot, one at base of wing, covering arculus, two between  $M_1$  and  $M_2$ , two between  $M_2$  and  $M_{3+4}$ , one in cell  $M_4$ , one oblong in anal cell and one at tip of wing, some of these pale spots subconfluent. Venation: Costa ending far beyond middle of wing length (74.8:122.2) and at level of midway between apices of  $M_{3+4}$  and  $Cu_1$ , relative length of R, M, and stem of fMCu about 36.2:31.5:47.8, Rs about twice as long as  $R_1$ , first radial cell slit-like, second cell well formed, long and about twice as long as first cell (17.2:9), base of  $M_2$  atrophied, fMCu under midway of first radial cell or under tip of  $R_1$  and rarely just beyond tip of  $R_1$ ,  $M_{3+4}$  about twice of  $Cu_1$  (40.3:19.3). Haltere varying brown to white, but often pale brown.

Abdomen pale brown or brown, with narrow scales, with cerci brown, subcutaneous granules indigo blue. Two spermathecae, pale brown, slightly unequal, oblong, about 2+33 by 20 units and 2+33 by 21 units and each with short neck part of duct.

Holotype, male (US 64024), east Ngatpang, Babelthuap, Palau, 65 m., light trap, Dec. 10, 1952, Gressitt. Allotype, female (BISHOP 2754), Itouda, 1,500 m., Kamo Valley, Wisselmeren, Netherlands New Guinea, light trap, Aug. 12, 1955, Gressitt. Paratypes, Palau: Two females, Ngiwal, Babelthuap, May 19, 1957, Sabrosky; male (BISHOP); same data as for holotype; female, Imeliik, Babelthuap, June 6, 1957, Sabrosky. Netherlands New Guinea (Wisselmeren): Female, Waghete, light trap, Aug. 16, 1955, Gressitt; five females, with allotype, Itouda, Kamo Valley, Aug. 14, 1955, Gressitt.

DISTRIBUTION: Caroline Is. (Palau), western New Guinea.

The male of *F. squamianulipes* is somewhat related to the Japanese *F. annulipes* Tokunaga, especially in the structure of the hypopygium and in general coloration. However, in *annulipes*, the TR of the hind legs is about 1.24, somewhat smaller than 1.32-1.52, the antennal segment 11 is smaller than the following two taken together (84 units: 50+46 units), differing from the subequal condition of the present species (78 units, approximately equal to 42+37 units), and the styles of the hypopygium are somewhat clavate at tips. The female of *squamianulipes* is related to Formosan *F. formosae* Kieffer, but in the latter species, the AR is about 0.72, smaller than 0.89, and the hind femur is provided with two dark rings as in fore and middle femora, differing from *squamianulipes*, in which the hind femur is dark brown with a yellowish base. The species name is related to the very scaly and banded legs.

#### Subgenus *Synthyridomyia* Saunders (1956)

*Synthyridomyia* Saunders, L. G., 1956, Canadian Jour. Zool. 34: 688.

Small, not longer than 1.5 mm. in body length and usually without scales, but in some species very slender non-striped scales on costal area of wings and tarsal segments of legs.



Flagellar segments of female subspherical basally, becoming gradually elongate distally and without abrupt change between segments 9 and 10. In male, antennal segment 11 usually longest, but rarely flagellar segments do not differ strongly from those of female. Maxillary palp usually five-segmented, but in a few species distal two segments more or less fused, segment 3 with scattered sensillae on surface, but rarely with deep sensory pit. Wings unmarked, moderately covered with macrotrichia and bare areas along veins almost absent; costa ending at about middle of wing, first radial cell very narrow or absent, second cell opened. Legs with empodia long and slender; hind TR 2.1 to 2.9. Single spermatheca. Male hypopygium with or without caudal emargination of sternite 9, aedeagus variously developed, parameres not connected with each other, with variously shaped basal roots and caudal lobes arising from bases of coxites.

**29. *Forcipomyia* (*Synthyridomyia*) *unituberculata* Tokunaga, n. sp. (fig. 30).**

Very small, pale brownish white; scattered sensillae on segment 3 of maxillary palp, pale reticular sculpture on apical segments of antenna. Legs with hind TR about 2.57 in male and about 2.79 in female; wing with vein  $M_2$  highly reduced. Male hypopygium very specific in possession of small tail-like tubercle on sternite 9 and of complicated aedeagus and parameres. Single spermatheca, large and with hyaline dot-like punctures.

*Male*: Body about 1.3 mm. long. Wings about 0.65 mm. by 0.24 mm. Coloration generally pale brownish white; abdomen with fine, pale-bluish, subcutaneous granules of adipose tissue on sides; legs almost white. Almost entire surface of the body covered with slender hairs very minutely plumy beside ordinary setae.

Head pale brown, with eyes just contiguous above, proboscis shorter than half length of head capsule; clypeus with about 20 setae. Maxillary palp with segment 3 somewhat fusiform, sensory pore absent, sensillae scattered on ventral side just beyond middle of segment 3. Antenna with scape and apical five segments pale brown, preceding basal short flagellar segments yellowish; apical five segments gradually elongate and not distinctly differentiated in shape and development of verticils, highly differing from other species of the genus; ultimate three segments with pale mesh-like sculpture on surface; relative lengths of segments 2 to 10 and 11 to 14 together about 86.5:45.5, those of distal eight segments about 7:6.8:7.3:8:8.8:9.8:10:15.

Thorax entirely very pale brown; scutellum with six strong bristles along caudal margin and about eight small setae. Legs white, with claws very slender, hind TR about 2.57, hind tibial comb with five strong bristles; leg segments, except for basal two, about 89:89:45:16:15:13:12 in fore leg in proportion, 99:99:45:18:17:14:13 in middle, and 99:91:54:21:19:16:14 in hind.

Wing rather broad, very pale brown, with veins also very pale, macrotrichia thick and bare areas along veins indistinct. Venation: Costa ending slightly beyond middle of wing length (29:50), relative length of R, M, and stem of fMCu about 12:10:23, Rs about twice as long as  $R_1$  (13:6) and ending just beyond tip of  $Cu_1$ , first radial cell slit-like, second radial cell distinct, elongate, triangular and longer than contact part of  $R_1$  and Rs (6.5:5), fMCu just beyond middle of second radial cell,  $M_{1+2}$ ,  $M_2$ ,  $Cu_2$  and 1A more or less atrophied. Haltere very pale brownish white.

Abdomen mainly white, with fine, pale-bluish, subcutaneous granules, tergites and sternites highly reduced. Hypopygium also mainly white, but styles, bases of parameres, apical margin of aedeagus, and sternal tubercle brown; sternite 9 with peculiar, tail-like, short tubercle on middle of caudal margin, caudal membrane quite bare; tergite 9 tapered, rather long, but little shorter than basal width (40:45), truncate at caudal margin and with pair of blunt, triangular, anal points; coxites longer than tergite and about 1.8 times as long as basal width (43:24); styles short, about 0.6 of coxites, tapered, arcuate, and pubescent only on basal one-third; aedeagus very broad, subsquare, with basal roots strongly curved and dark, caudal margin thickened and with pair of minute tubercles, broad median membranous area with V- or Y-shape brown marking; parameres quite separate and strongly curved, with basal arms dark, straight, about one-third or a quarter

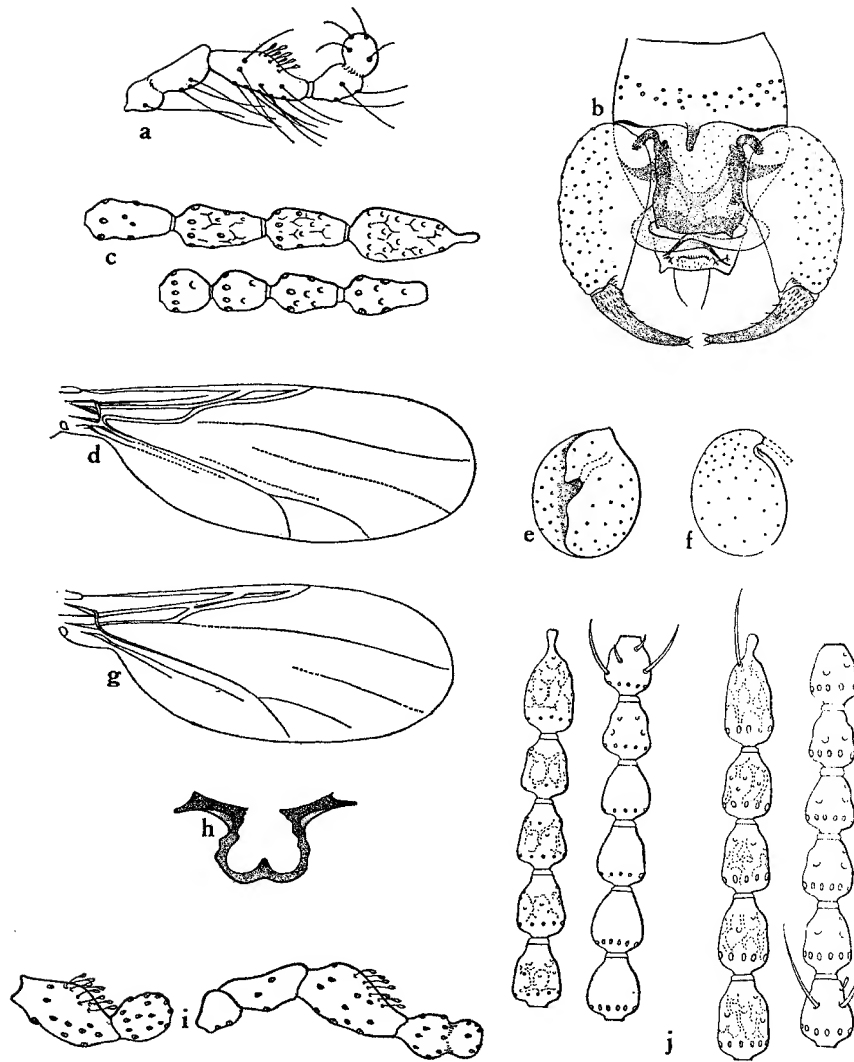


FIGURE 30.—*Forcipomyia* (*Synthyridomyia*) *unituberculata*. a-d, male: a, maxillary palp; b, hypopygium; c, distal eight flagellar antennal segments; d, wing (macrotrichia omitted), e-j, female: e, spermatheca of allotype; f, spermatheca of paratype; g, wing (macrotrichia omitted); h, subgenital plate; i, maxillary palp (one with subconstricted apical segments and one with fused apical segments); j, distal 11 flagellar segments of two different females.

of total length and each connected with base of coxite by triangular small plate, caudal lobes large, pale brown, strongly recurved around caudal margin of aedeagus, tapered on apical half, with apical tips very slender and curved again.

*Female*: Body length about 1.19 (1.04-1.37) mm. Wings about 0.72 (0.69-0.74) mm. by 0.3 (0.28-0.31) mm. General coloration, vestiture and structure as in male with usual sexual differences.

Head with eyes just contiguous above, proboscis about half as long as head capsule, clypeus highly setigerous and with about 30 (28 to 38) setae. Maxillary palp rather stout, segment 3 with scattered sensillae (in a paratype sensillae not visible) and without sensory pores, last two segments more incompletely segmented than in male, five segments in proportion of 5.3:11.5:13.2:6:4.8. Antenna with flagellar segments, except for basal and ultimate, all similar in shape and with similar verticils, but apical five segments with pale mesh-like sculpture; AR about 0.74 (0.72-0.77); relative length of distal ten segments about 7.9:7.8:7.3:7.4:7.8:8.7:8.7:8.5:8.6:13.9.

Thorax with tergal side uniformly pale brown, sternal and pleural sides pale brownish yellow, scutellum with six strong and four smaller bristles and about 13 minute hairs. Legs all pale yellow, claws slender, but slightly thickened preapically, hind TR about 2.79 (2.75-2.86), hind tibial comb with five strong bristles; leg segments, except for basal two, in proportion of 83:82:47:15.7:13.7:13.2:12.2 in fore, 99:102:48.8:17.5:15:13.2:11.5 in middle, and 98:91:57.7:20.7:18:15.2:11.7 in hind leg.

Wing with costal margin distinctly arcuate, very pale including veins, thickly covered with hairs, without distinct bare areas along veins. Venation: Costa distinctly beyond middle of wing length (35.7:55.2), relative length of R, M, and stem of fMCu about 11.7:10.3:24.3, Rs about twice of R<sub>1</sub> (8:16.5) and ending at level of middle of anal margin of cell M<sub>1</sub>, first radial cell slit-like, second cell narrow, but distinct and little longer than first (8.2:7.3), fMCu under tip of R<sub>1</sub> and M<sub>3+4</sub> about twice as long as Cu<sub>1</sub> (16.7:8.7). Haltere very pale brown.

Abdomen pale brownish yellow or white, with bluish granules similar to those of male, tergites transverse and subsquare, caudal three or four segments including cerci slightly more brownish; subgenital plate with slender ring-like sclerite; single spermatheca, rather large (3.3+23.3 by 18.7 units), brown, oval, with minute hyaline punctures and small neck part.

Holotype, male (US 64592), Peleliu, Palau Is., light trap, May 28, 1957, Sabrosky. Allotype, female (US), with holotype. Paratypes, two females (BISHOP), Ngaremlengui, Babelthuap, Palau Is., June 3, 1957, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau).

This species is highly specific in possession of the unique structures of the aedeagus, the parameres, and sternite 9 of male hypopygium. In the type species of the subgenus, *F. (S.) acidicola* Tokunaga, the aedeagus is subdivided into a pair of lateral sclerites, somewhat resembling that of *Lasiohelea*, the parameres are separate and V-shape, each with basal arm almost straight and caudal lobe drumstick-like, and sternite 9 has a semicircular caudal incision; while, in this species the aedeagus is almost square and very broad, not subdivided along mid-ventral line, the parameres are provided with subtriangular and plate-like basal arms and very large caudal lobes which are sharply pointed and strongly recurved, and sternite 9 is provided with a small tail-like tubercle instead of an incision. The female is also specific in possession of the peculiar antennae: The distal five segments are provided with reticular relief on the surface as in some *Dasyhelea* species.

Subgenus **Neoforcipomyia** Tokunaga, new subgenus

*Type species: Forcipomyia pectinunguis* de Meijere, by present designation.

Female similar to *Lasiohelea*, in the following points: Basal flagellar segments sub-spherical, distinctly shorter than ultimate five segments and never flask-shape; maxillary palp completely segmented; hind TR larger than 2.4; wings unadorned, rather densely haired with slender macrotrichia; costa distinctly beyond middle of wing, second radial cell narrow, long, and at least as long as first, first radial cell obliterated and slit-like; two spermathecae. Male hypopygium with parameres arch-like, being similar to those of *Proforcipomyia*, but with spoon-shape caudal lobes arising from joints of coxites at lateral ends of arms of parameres as in *Trichhelea*; aedeagus somewhat shield-shape; sternite 9 much shorter than wide and without deep caudal emargination; empodia of male legs vestigial.

The type species of this subgenus was classified in *Lasiohelea*, but very recently the male was described by Wirth (1956, Am. Ent. Soc., Ann. 49: 360-361) and the peculiar structure of its parameres is thought to represent a new subgenus based on the recent systematic study of Saunders (1956, Canadian Jour. Zool. 34: 657-705).

## KEY TO MICRONESIAN SPECIES OF SUBGENUS NEOFORCIPOMYIA

1. Male with second radial cell of wing shorter than twice length of first cell, TR of hind leg about 2.6; styles of male hypopygium somewhat clavate. Female with sub-basal comb-like process of claw.....30. *pectinunguis*  
 Male with second radial cell of wing as long as twice length of first cell, TR of hind leg about 3.2; styles of male hypopygium sharply pointed and slender. Female unknown.....31. *basiflava*

30. **Forcipomyia (Neoforcipomyia) pectinunguis** (de Meijere). (Figure 31.)  
*Ceratopogon pectinunguis* de Meijere, 1923, Tijdschr. Ent. 66: 137 (Sumatra).—Macfie, 1934, Tijdschr. Ent. 77: 207.  
*Lasiohelea pectinunguis* (de Meijere), Tokunaga, 1940, Philippine Jour. Sci. 71 (2): 207 (Kusaie).—Esaki, 1940, Philippine Jour. Sci. 71 (2): 226.

Brown to dark-brown. In female, mouthparts with pair of large labella, segment 3 of maxillary palp with scattered sensillae on apical half of ventral side; claws of legs with pectinate lobes on sub-basal part, TR of hind legs larger than 2.5; wing with costa long and ending far beyond middle of wing. In male, TR of hind legs also larger than 2.5; wing with costa ending also far beyond middle; parameres of hypopygium represented only by widely opened U-shape, rather broad arms, median lobes atrophied.

*Female*: Body length about 1.34 (1.2-1.5) mm. Wing 0.94 mm. by 0.41 mm.

Head dark brown including mouthparts, with eyes bare, broadly contiguous above, occipital setae curved forward; clypeus broad; proboscis triangular and stout, with large leaf-like labella. Maxillary palp with five segments in proportion of 6.8:10.1:21.8:11.5:10.7; segment 3 very large and with many scattered sensillae on distal half of mesal side. Antenna entirely dark brown, basal short flagellar segments about as long as wide, 9 slightly longer than wide, 10 to 13 about twice as long as wide, last segment about four times as long as wide; proportion of eight distal segments about 8.5:9.1:8.9:15:15.5:15.9:15.6:22.8; AR about 1.12.

Thorax dark brown or brown, slightly shiny, with setae yellowish brown; scutellum yellowish brown, with seven to nine strong bristles on caudal margin and about ten small setae on anterior half; scutum with two pairs of yellowish-brown spots on anterior margin and four brown subconfluent vittae, caudoscuteal area pale brown; postscutellum dark brown; pleural and sternal sclerites yellowish brown; membranous areas yellow. Legs brown to yellowish brown, with slender scales on tibiae and tarsi, tarsal segment 3 squarely thickened; TR of fore leg about 2.51, that of middle leg about 2.44, and that of hind leg about 2.61 (2.45-2.78); claws slender, strongly angulate, with asymmetrical sub-basal processes; one claw with small pectinate projection and other claw with needle-like spine and small deerhorn-like process; empodium large. Leg segments, except for

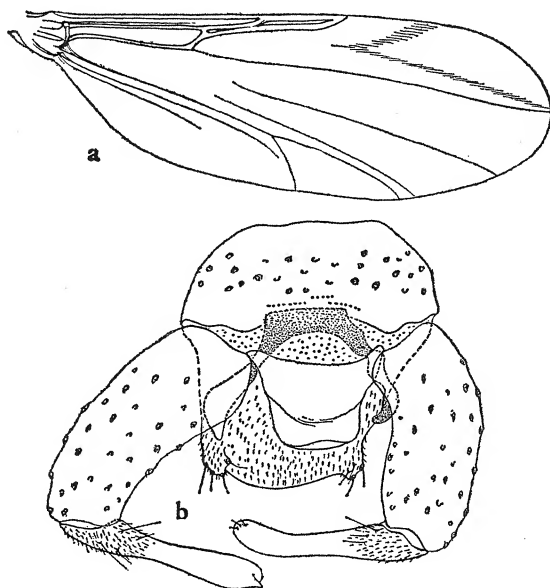


FIGURE 31.—*Forcipomyia* (*Neoforcipomyia*) *pectinunguis*, male: a, wing (hairs omitted); b, hypopygium.

basal two, in proportion of 96.3:93.3:49.6:17.9:15.4:13.1:13.7 in fore leg, 114:111.3:45.8:18.9:16.4:14.6:13.5 in middle leg, and 119.3:109.3:61.4:23:18.3:14.9:15 in hind leg.

Wing dark brownish gray, with dark slender hairs thickly all over surface, with veins brown, intercalary fork of cell  $R_5$  distinct. Venation: Costa ending far beyond middle of wing, about 0.65 as long as wing (46.4:70.4), slightly produced beyond end of  $R_5$ , second radial cell narrow and long, about 1.5 times as long as obliterated first cell (12:8.5),  $R$ ,  $R_1$ , and  $R_5$  in proportion of 16.8:9.7:21, r-m very short, vertical and slightly longer than  $M_{1+2}$ , base of  $M_2$  broadly atrophied, fMCu just beyond tip of  $R_1$ , tip of  $Cu_1$  ending at level of middle between tips of  $R_1$  and  $R_5$ , tip of  $R_5$  ending at middle between tips of  $M_{3+4}$  and  $Cu_1$ ,  $M_1$  ending just before wing tip. Haltere brown.

Abdomen yellowish brown, with yellowish-brown setae, tergites and sternites not reduced, lateral membranes yellow; cerci discoidal, round and brown to pale brown; two spermathecae, distinctly unequal, brown, short oval, with very short chitinized duct, about 14.8 by 10.8 units and 11.5 by 9.8 units.

*Male*: Body length about 1.52 mm. Wing about 0.31 mm. by 0.92 mm.

Head with vertex dark brown, frons and mouthparts brown, eyes bare and broadly contiguous above. Antenna with scape dark brown; maxillary palp and flagellar segments of antenna broken.

Thorax brown, but humeral angles and lateral margins of scutum somewhat yellowish; scutellum brown, with seven strong bristles and four small setae along caudal margin and several minute setae on cephalic half. Legs brown; tarsi with slender scales; TR of fore leg about 2.55, that of middle leg about 0.95, and that of hind leg about 2.61; leg segments with proportion of about 98:96:51:20:17:14: ? in fore leg, 115:110:59:20:19:16: ? in middle leg, and 116:110:60:23:21:16:15 in hind leg. Claws slender.

Wing pale brownish gray, not very narrow, about one-third as wide as long, with hairs rather sparse. Venation: Costa ending far beyond middle of wing (47:72), Rs as long as R and much longer than twice of  $R_1$  (19:19:7), first radial cell very narrow and slit-like, second radial cell narrow, long and slightly shorter than twice of first cell (42:25), fMCu beyond tip of  $R_1$ , Cu<sub>1</sub> ending before tip of Rs, costal end at level of distal one-third of anal margin of cell  $M_4$ , inner angle of fMCu about 45 degrees. Haltere pale brown.

Abdomen brown, slightly paler than thorax. Hypopygium with sternite 9 twice as broad as long on caudal margin, which is slightly concave, its caudal membrane bare; tergite 9 somewhat trapezoid, anterior width about 1.5 times as broad as length or width of caudal margin, which is very slightly convex. Coxites slender, slightly curved, about 2.4 times as long as wide (31:13); style hardly as long as coxite (28:31), almost straight or very slightly curved at apical one-third, slightly clavate at tip. Aedeagus broadly trapezoid, its basal arch very low and basal angles blunt, median part as long as middle width, caudal margin very slightly rounded; parameres without median lobes, lateral arms broadly divergent caudad, somewhat broadened near junctions to basal ridges of coxites, median part rather broad.

DISTRIBUTION: N. Mariana Is., Caroline Is., Sumatra, Samoa.

N. MARIANA IS. AGRIHAN: Female, July 1951, Bohart.

PALAU. BABELTHUAP: Ngaremlengui, two females, light trap, June 1957, Sabrosky.

PONAPE. Agric. Exper. Sta. 31, female, Aug. 1950, Adams; Colonia, Agric. Exper. Sta., female, light trap, Jan. 1953, Gressitt; 16 m., female, Jan. 1953, Gressitt; Mt. Temwetemwensekir, female, Jan. 1953, Gressitt.

KUSAIE. Pukusrik, female, light trap, Mar. 1953, Clarke; Mutunlik, male, four females, Jan., Mar. 1953, Clarke.

HOSTS: Lepidopterous adults, *Milchrista cruciata* Walker, *Simplicia marginata* Moore, and *Chromis erotus eras* Boisduval.

### 31. *Forcipomyia* (*Neoforcipomyia*) *basiflava* Tokunaga, n. sp. (fig. 32).

Rather small, brown. Male without scales on wings, legs and other parts. Maxillary palp of male slender, with ultimate segment longer than penultimate, segment 3 with small sensory pore. Antenna of male with segment 11 much shorter than every one of following segments. Male scutellum with only four bristles; hind TR about 3.2; claws bifid at tip. Male wing without markings, with second radial cell very narrow and long. Hypopygium of male with rather broad membranous caudal emargination of sternite 9, parameres U-shape and with short lateral caudal lobes, styles sharply pointed and slender, and aedeagus with oval marginal thickening.

*Male*: Body length about 1.44 mm. Wings about 0.86 mm. by 0.27 mm. Antenna with segments 2 to 11 yellowish white and other segments brown.

Head mainly brown, with mouthparts white, eyes contiguous above, proboscis much shorter than half length of head capsule (8:22), clypeus with several median setae.

Maxillary palp rather slender, with segment 3 fusiform and with small sensory pore just beyond middle, last segment comparatively large and as large as segment 3 and five segments in proportion of 5:9:11:7:11. Antenna with scape and apical three segments brown and intermediate flagellar segments yellowish white; relative combined length of segments 2 to 10 and 11 to 14 together about 85:105; distal eight segments about 8.5:7.9:7.8:7:18:28:23.8:33.8 in proportion.

Thorax brown; scutellum with only four bristles. Legs mainly pale yellowish brown and basal four tarsal segments pale yellowish white; hind TR about 3.2; claws slender and bifid at apices; apical tibial comb of hind leg with four or five bristles; legs with seven segments in proportion of 84:83:49:16:14:12:12 in fore, 102.5:97:51:20:19:14:12 in middle, and 98:95:64:20:19:14:13 in hind leg.

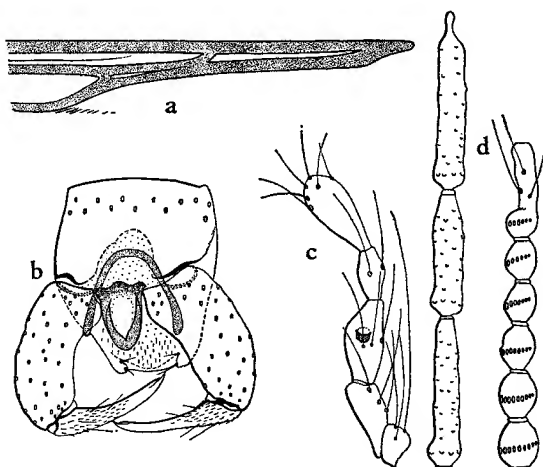


FIGURE 32.—*Forcipomyia* (*Neoforcipomyia*) *basiflava*, male: a, stigmatal area of wing; b, hypopygium; c, maxillary palp; d, distal nine flagellar antennal segments.

Wing generally very pale, but veins brownish, and with bare areas along veins broad. Venation: Costa ending beyond middle of wing length (38:66), relative length of R, M, and stem of fMCu about 19:16:28, Rs long and much longer than twice length of R<sub>1</sub> (14:5), first radial cell slit-like, second very narrow and twice as long as first (8:4), fMCu under middle of second radial cell, M<sub>3+4</sub> about twice as long as Cu<sub>1</sub> (19:9). Haltere pale brownish white.

Abdomen brown, but slightly yellowish generally. Hypopygium with sternite 9 about two-thirds as long as wide, its caudal emargination rather large, U-shape, and bare, band of setae before middle; coxites slightly curved, rather slender, and about twice as long as basal width; styles slender, sharply pointed, claw-like, and little shorter than coxites (23.5:27); aedeagus small, oval, with marginal thickening and without basal arch; parameres U-shape, slender, and with short lateral caudal lobes, each arising from lateral end of paramere.

*Female*: Unknown.

Holotype, male (US 64593), Nanpohnmal, Ponape I., Jan. 10, 1953, Gressitt.

DISTRIBUTION: Caroline Is. (Ponape).

This species is very closely allied to *F. (N.) pectinunguis* de Meijere in the structure of male hypopygium. The male hypopygia of this subgenus seem to be quite similar to those of *Proforcipomyia* superficially, but the lobes of parameres arise from the bases of the basal arch of the parameres where the bases of the coxites are joined dorsally, highly differing from those of *Proforcipomyia*.

#### Subgenus *Thyridomyia* Saunders (1925)

*Thyridomyia* Saunders, L. G., 1925, Parasit. 17:268; 1956, Canadian Jour. Zool. 34:691.

Basal flagellar segments of female antenna more or less flattened or subspherical, penultimate four segments usually not notably elongate and sometimes segment 10 subequal to or slightly longer than 9. Segment 11 of male antenna usually longest. Maxillary palp completely five-segmented. Legs with well-developed empodia between claws in both sexes; hind TR 2.3 to 3.0. Wing unmarked, rather thickly covered with unflattened macrotrichia, without bare areas along veins; costal veins ending at middle of wing or little beyond it, first radial cell obliterated except in a few species, second radial cell usually as long as its stem vein, subtriangular in female and subrhombic in male, but in a few species obsolete in both sexes,  $M_2$  more or less atrophied. Single spermatheca. Male hypopygium with elongate segment 9 bearing large membranous window of various shapes but usually like Moorish arch; coxites usually cylindrical and rather long; styles usually very slender and sharply pointed; aedeagus complicated and with chitinized lateral sclerites; parameres forming pair of subtriangular internal plates associated with basal apodemes of coxites, but in some species these internal plates reduced to small slender sclerites or well developed and connected, caudal external lobes absent.

#### KEY TO MICRONESIAN SPECIES OF SUBGENUS *THYRIDOMYIA*

1. Male aedeagus with basal arch very low and without apical hook-like structures.  
     Female hind TR less than 3.0; penultimate four antennal segments not much longer than preceding ones.....32. *esakii*  
     Male aedeagus with basal arch high and with well-developed apical hook-like structures. Female unknown.....33. *hamata*

#### 32. *Forcipomyia (Thyridomyia) esakii* (Tokunaga). (Figure 33.)

*Lasiohelea esakii* Tokunaga, 1940, Tenthredo 3 (2): 169 (Palau).

Small; male very pale brownish yellow and female more brownish; scales absent in both sexes. Wing with two radial cells more or less obscure, subequal in length, in male median veins highly reduced and in female  $M_{1+2}$  and bases of its two branches reduced. Male maxillary palp without sensory pores and scattered sensillae, but female with distinct pores; female flagellar segments, except for first and last segment, discoidal to subspherical and not distinctly differentiated; scutum with ill-defined yellowish slender stripes on foveae, and lateral clouds and caudoscuteal area also yellowish; scutellum yellowish. Legs pale brownish or yellowish; male hind TR about 2.6 and female about 2.85. Male hypopygium with sternite 9 broadly membranous on central part of caudal half, aedeagus with thickened lateral sides, parameres represented by pair of small subsquare thickenings and styles very slender. Female subgenital plate rather broad and with two arms subrhombic, one spermatheca, subpyriform.

*Male:* Body about 1.2 mm. long. Wings about 0.72 mm. by 0.23 mm. General coloration very pale brownish yellow, mouthparts, antenna, legs, and hypopygium pale yellow,



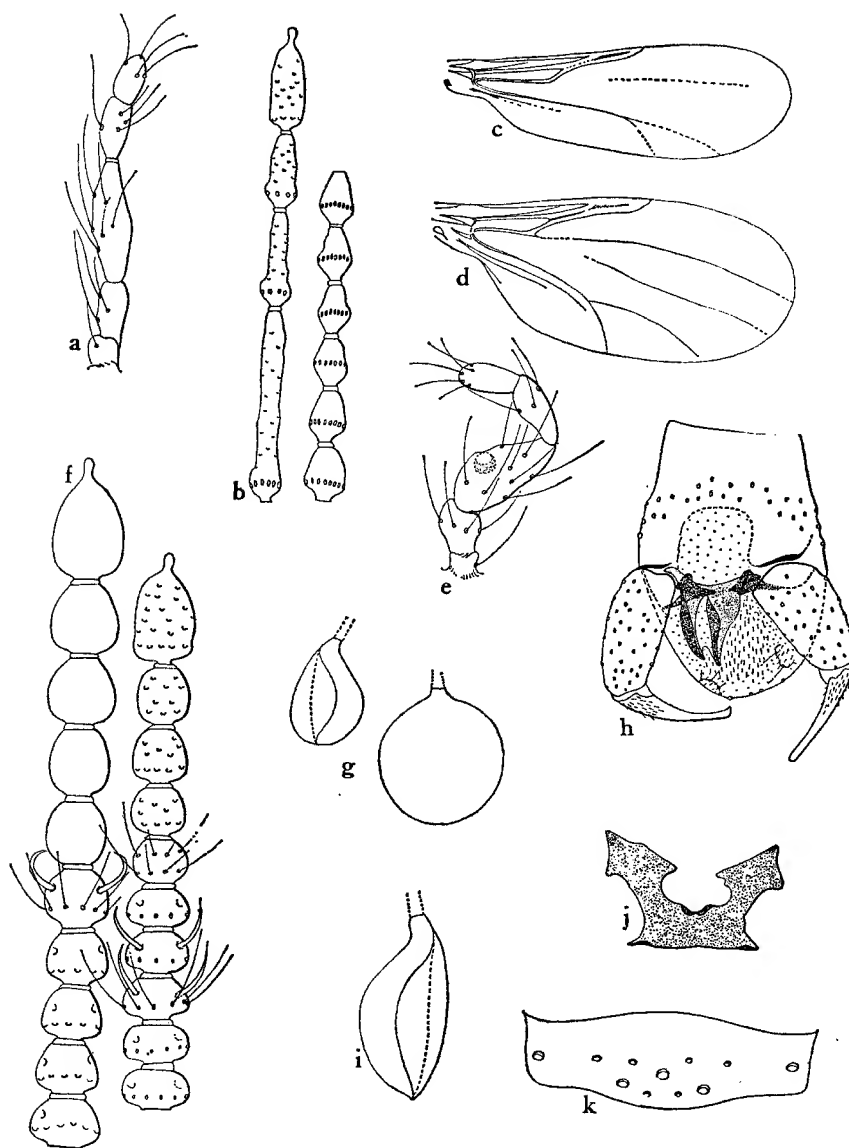


FIGURE 33.—*Forcipomyia* (*Thyridomyia*) *esakii*. a-c, male: a, maxillary palp; b, distal ten flagellar antennal segments; c, wing (macrotrichia omitted). d-g, female: d, wing (macrotrichia omitted); e, maxillary palp; f, distal ten flagellar antennal segments of two different females; g, spermathecae. h, hypopygium male. i-k, female: i, spermatheca; j, subgenital plate; k, scutellum.

abdomen mainly white, scutum with paired stripes on foveae ill-defined and yellowish, lateral similar clouds covering scutal suture and caudoscuteal area yellowish; scales almost absent.

Head pale brownish yellow, with eyes just contiguous above, proboscis about half as long as head capsule, clypeus with about nine setae. Mouthparts pale yellowish white; maxillary palp slender, segment 3 without distinct sensory pores and scattered sensillae, five segments in proportion of 4.8:14:6:5. Antenna with scape brown, other segments yellowish white. Segment 11 longest, about as long as 8 to 10 or 12 to 13 together, combined relative length of segments 2 to 10 and 11 to 14 about 91:73, proportional length of apical eight segments about 8:8.5:9:9:28:15:12:16.5.

Thorax almost entirely pale brown, scutum with ill-defined yellow stripes on foveae and clouds on lateral side and similar caudoscuteal area; scutellum with four strong bristles and few median small setae. Legs yellow, hind TR about 2.6, hind tibial comb with five strong bristles, claws slender; leg segments, except for basal two, in proportion of 75:75:42:15:13:11:12 in fore, 89:84:38:17:15:11.5:10.5 in middle, and 87:82:47:18:16:13:11 in hind leg.

Wing almost colorless, with veins pale brown, entirely hairy, and without scales and distinct bare areas along veins. Venation:  $M_{1+2}$ ,  $M_1$ ,  $M_2$ ,  $M_{3+4}$ ,  $Cu_2$ , and 1A more or less atrophied; costa ending beyond middle of wing (32.5:55),  $R_s$  about twice as long as  $R_1$ , first radial cell slit-like, two radial branches in contact side by side, second radial cell as long as contact part of the two veins and opened but obscure, relative length of R, M, and stem of fMCu about 15:14:26, fMCu slightly before level of tip of second radial cell,  $Cu_1$  ending under costal end and about half as long as  $M_{3+4}$  (8:15). Haltere very pale brown.

Abdomen mainly white, but caudal three segments pale brown and hypopygium pale yellow, tergites and sternites reduced. Hypopygium with sternite 9 rather long, half as long as total length of hypopygium, with band of setae at middle and caudal median part broadly membranous and bare; tergite 9 round on caudal margin; coxites slender, sub-cylindrical, as long as sternite 9 (20:20) and about twice as long as basal width (20:11); styles very slender, as long as coxites (19:20), tapered and slightly arcuate; aedeagus with basal arch very low and with pair of caudal lobes as long as basal width of aedeagus, tapered and pointed; parameres not well developed, represented by pair of strongly chitinated, small, and subsquare sclerites at mesal angles of bases of coxites.

*Female:* Body length about 1.18 (0.98-1.31) mm. Wing about 0.69 (0.64-0.74) mm. by 0.3 (0.26-0.33) mm. Coloration generally more brownish than in male.

Head almost entirely brown including appendages, with eyes just contiguous above, proboscis about half as long as height of head capsule, clypeus with various number of setae from seven to 17. Maxillary palp rather stout, with distinct sensory pore and five segments in proportion of 4.3:7.5:13.5:8.3:6.8. Antenna entirely brown, with penultimate four segments almost spherical, not distinctly different from basal short flagellar segments, short basal flagellar segments distinctly discoidal, being shorter than wide, segment 10 usually spherical or sub-discoidal, not distinctly differing from 9 and shorter than following distal segments; AR about 0.88, from 0.78 to 0.94; distal nine segments about 5.5:5.5:5.5:5.6:6.4:6.6:7:7:13.4 in relative length.

Thorax mainly brown, but scutellum yellowish, scutum with caudoscuteal area, lateral parts and slender stripes on foveae yellowish; scutellum with seven bristles along caudal margin, postscutellum brown and pleural and sternal sclerites pale brown. Legs with coxae, trochanters, femora, basal half of tibiae and last tarsal segments pale brown or yellowish, apical half of tibiae and following four tarsal segments very pale brown; hind leg with TR about 2.85, from 2.63 to 2.97, hind tibial comb with five or six apical marginal bristles; claws rather slender, but slightly thickened preapically: proportional length of segments, except for basal two, about 71.3:69.3:37.5:13.6:12.5:10.3:11.3 in fore, 84.5:85.8:37.1:15.4:13.5:10.5:10.8 in middle, and 85.3:81.5:45.3:16:14:12:11.5 in hind leg.

Wing entirely pale brown including veins, without scales, bare areas along veins indistinct. Venation: Costa distinctly beyond midway of wing length (32:52.9) and ending just before middle of anal margin of cell  $M_4$ , relative length of R, M, and stem of

fMCu about 10.8:8.5:21.8, Rs about twice as long as  $R_1$  (15.1:7.1), two radial cells slit-like, usually second radial cell a little longer than first (7:5.8) but sometimes subequal and rarely its shape obscure,  $M_{1+2}$  and bases of two branches more or less atrophied and rarely  $M_2$  entirely reduced, fMCu under tip of  $R_1$ ,  $M_{3+4}$  about twice as long as  $Cu_1$  (16.3:7.9). Haltere pale brownish yellow.

Abdomen very pale brown, without scales, tergites transverse, subsquare and somewhat more brownish, sternites reduced, cerci yellow. One spermatheca brown, short-oval (2.3+10.3 by 8.7 units) and with short neck of duct, but in one paratype larger, being 4+17 by 14 units as illustrated. Subgenital plate rather broad, with median opening oval and transverse, caudal arms subrhombic.

**DISTRIBUTION:** Southern Mariana Is., western Caroline Is.

Allotype, male (US), Exper. Sta. 84, Saipan I., Jan. 26, 1945, Hagen. Paratypes, six females (BISHOP, US), Ngaremlengui, Babelthuap I., Palau Is., light trap, June 1, 3, 1957, Sabrosky; female (MCZ), Yap Is., Aug. 31, 1950, Goss.

YAP. YAP: Hill behind Yaptown, 60 m., female, Dec. 1952, Gressitt.

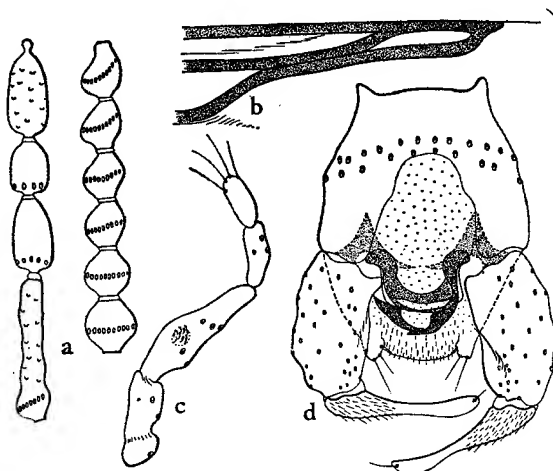


FIGURE 34.—*Forcipomyia* (*Thyridomyia*) *hamata*, male: a, distal ten flagellar antennal segments; b, stigmal area of wing; c, maxillary palp; d, hypopygium.

### 33. *Forcipomyia* (*Thyridomyia*) *hamata* Tokunaga, n. sp. (fig. 34).

Small, brown. Maxillary palp of male with small sensory pore on slender segment 3. Segment 11 of male antenna longest and only little shorter than twice length of 12. Empodia as large as claws; hind TR about 2.65-2.9 in male. Wing without scales, bare areas along veins indistinct, first radial cell slit-like in male; second radial cell opened and shorter than first. Hypopygium of male: Aedeagus with pair of hook-like structures on apical part and basal arch rather large; parameres represented by pair of pointed subtriangular ental plates; styles slender and as long as coxites.

*Male:* Body about 1.3 (1.2-1.33) mm. long. Wing about 0.82 mm. by 0.25 mm. Coloration generally brown.

Head brown, with mouthparts pale or yellowish brown, eyes bare and narrowly contiguous above, proboscis long and longer than half length of head capsule; clypeus

with seven to eight setae. Maxillary palp slender, segment 3 with very shallow sensory pore at or just before middle and five segments in proportion of 5:8.5:17:7.5:6. Antenna entirely brown, with segment 11 far longer than ultimate and little shorter than 12, combined proportional length of segments 2 to 10 and 11 to 14 together about 81:62.5, relative length of distal eight segments about 7:7:7.5:8.5:24:13:10:16.

Thorax largely brown, but scutellum yellowish and scutum with ill-defined yellowish clouds above wing bases covering scutal sutures; scutellum with five or seven strong bristles and seven to ten small setae. Legs with coxae and last tarsal segments brownish, other segments all very pale or yellowish pale brown, without scales, claws very slender and simple, empodia developed but small and shorter than claws; hind tibial comb with five apical bristles; hind TR about 2.76, from 2.65 to 2.9. Proportional length of leg segments, except for basal two, about 77:72:40:14:12.5:10:12 in fore, 85.5:84:38:16.5:15:10.8:11 in middle, and 86:82:49.3:17.5:15.8:12:11.8 in hind leg.

Wing with macrotrichia rather thickly spread all over surface and without scales, veins very pale, bare areas along veins obscure. Venation: Costa ending slightly beyond middle of wing (32.5:62.8), R, M, and stem fMCu in relative length of 14.5:11.5:26.5, Rs about 1.5 times as long as R<sub>1</sub> (12.5:8.5), first radial cell slit-like, second cell opened and little shorter than its stem vein (6.3:4.5), fMCu under tip of costa, M<sub>2</sub> entirely obscure, M<sub>3+4</sub> about 2.5 times as long as Cu<sub>1</sub>. Haltere very pale brown.

Abdomen brownish. Hypopygium brown, long; sternite 9 long but shorter than wide (26:31) and with caudal emargination bare, very large and U-shape or slightly Moorish-arched, as long as wide (15:15); tergite 9 longer than wide (39:30.5) and round on caudal margin; coxites cylindrical and about twice as long as wide (22:11.5); styles slender, fully as long as coxites (22.3:22), and slightly swollen apically; aedeagus rather broad, as long as width at middle (12:11), but far shorter than basal width (12:14.5), basal arch high and about half of total length, with basal roots strongly curved, cross bar at middle rather broad and pair of apical hook-like structures strongly curved and rather sharply pointed; parameres represented by pair of subtriangular internal plates at bases of coxites.

*Female:* Unknown.

Holotype, male (US 64595), Ngaremlengui, Babelthuap I., Palau Is., June 1, 1957, light trap, Sabrosky. Paratypes, Palau, two males (US), same as holotype, June 1-3, 1957, at light, Sabrosky; Koror I., male (BISHOP), May 30, 1957, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau).

This species is very closely allied to the Japanese *F. (T.) kitasirakawae* Tokunaga and the Canadian *F. (T.) aspinosa* Saunders, especially in the structure of the male hypopygium. However, in the Japanese species, the total length of the apical four segments of the male antenna is about 0.88 to 0.95 as long as that of segments 2 to 10 (in the present species about 0.78 or less), hind TR of the male is 2.3-2.7, and the aedeagus is smaller. In the Canadian allied species, the hind TR is smaller, 2.3, and the apical hook-like structures of the aedeagus are not sharply pointed and not strongly angulate.

#### Subgenus *Trichohalea* Goetghebuer (1920)

*Apelma* Kieffer, 1919 [not Billberg (1820)], Mus. Nat. Hungarici, Ann. 17: 64.

*Trichohalea* Goetghebuer, 1920, Mus. Roy. Hist. Nat. Belg., Mem. 8: 18.—Saunders, 1956, Canadian Jour. Zool. 34: 695-696.

Basal flagellar segments of female antenna discoidal to spherical, distinctly shorter than five cylindrical distal segments and sometimes segments 7 to 9 slightly longer than wide, being short-oval. Maxillary palp with ultimate two segments completely or incompletely segmented. Legs without scales; hind TR usually 2.0 to 3.0, but rarely less than 2.0 or larger than 3.0 in a few species; empodia well developed in female, usually absent or vestigial in male, but fully developed in a few species. Wings unadorned, rather thinly covered with macrotrichia, but bare areas along veins not distinct; costal vein ending at about middle or a little beyond middle of wing, first radial cell very slightly opened, slit-like or closed, second radial cell opened and longer than in subgenus *Forcipomyia* but shorter than in *Lasiohelea*, being as long as, or slightly longer than, first cell. Two spermathecae. Male hypopygium with sternite 9 broad and short; coxites subcylindrical, slender and not distinctly tapered; parameres H-shape, with cross bar between bases of coxites and paired forward-apodemal projections and backward external caudal lobes arising from bases of coxites; aedeagus broad and shield-like, but rarely with caudal processes.

#### KEY TO MICRONESIAN SPECIES OF SUBGENUS TRICHOHELEA

1. Male with aedeagus rather elongate and bearing one pair of curved apical processes. Female unknown.....36. *hamaticauda*  
 Male with aedeagus broadly shield-shape and not bearing any processes on either sides of apical part.....2.
2. Male with caudal lobes of parameres simple, spoon-like, and not bifid at apices and aedeagus without paired, dark, convergent structures. Female with basal short flagellar segments reduced in number, only four.....34. *oligarthra*  
 Male with caudal lobes of parameres not dilated apically and unequally bifid at apices and aedeagus with paired, dark, convergent structures. Female unknown .....35. *sabroskyi*

#### 34. *Forcipomyia* (*Trichohalea*) *oligarthra* Saunders (fig. 35).

*Forcipomyia* (*Trichohalea*) *oligarthra* Saunders, 1956, Canadian Jour. Zool. 34: 698.

Small, brown and yellow with ten-segmented female antenna. Scales of legs, wings, and other parts absent. Maxillary palp of female stout and segment 3 with deep sensory pore at middle. Antenna of female with basal eight flagellar segments reduced to four segments and AR about 2.6. Female legs entirely yellow, hind TR about 2.95, claws rather broad, wing with second radial cell long, two spermathecae, equal and short-oval. According to Saunders, male hypopygium as follows: Aedeagus with lateral lobed expansions and parameres H-shape and with curved spoon-like structures notched and double pointed at apices.

*Female*: Body about 1.34 mm. long. Wing about 0.85 mm. by 0.3 mm. General coloration brown and yellow.

Head with vertex brown, frons and mouthparts yellowish, eyes broadly contiguous above, proboscis about half as long as head capsule, clypeus with nine setae. Maxillary palp stout, segment 3 with deep sensory pore at middle, five segments with proportional length of 5:10:15:7:9. Antenna with scape dark brown, other segments brown, ten-segmented, segments from 3 to 5 flattened and discoidal, following five normal, elongate; AR about 2.6; relative length of nine distal segments about 16:6:6.5:6.5:17.5:19:17:17:24.

Thorax mainly brown, scutum with shoulder parts, lateral parts and caudoscuteal area yellowish, scutellum yellow and with about eight strong bristles and about ten small setae. Legs almost entirely yellow, hind tibial comb with six bristles, hind TR 2.9 to 3.0, claws rather broad at middle parts and each apparently provided with a minute spine-like process at outside of curved part before middle; relative length of seven segments about

89: 92: 51: 20: 16: 14: 15 in fore, 99: 104: 52: 20: 17: 13: 14 in middle, and 104: 97: 62: 21: 17.5: 15: 14 in hind leg.

Wing very pale brown, with anterior veins brown, without scales, bare areas along veins obscure. Venation: Costa ending beyond middle of wing (37.5: 65) and slightly beyond tip of  $Cu_1$ , relative length of R, M, and stem of fMCu about 15: 13: 28, base of  $M_2$  atrophied, Rs about 2.5 times as long as  $R_1$  (16: 6), first radial cell slit-like, second cell distinct, narrow and little shorter than twice length of first (9: 5), fMCu at level of midway of second radial cell,  $M_{3+4}$  about twice as long as  $Cu_1$  (19: 9). Haltere yellow.

Abdomen with sclerites light pale brown, tergites transverse and subsquare, sternites paler than tergites, transverse, and constricted at middle, cerci and caudal segments brown; two spermathecae, brown, subequal, short-oval (1+16.5 by 14 units and 1+17.5 by 15 units) and each with small neck part of duct.

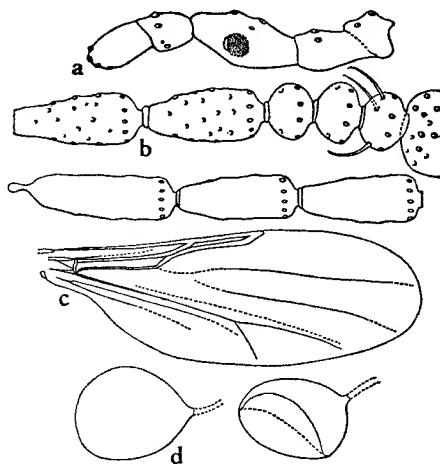


FIGURE 35.—*Forcipomyia (Trichohalea) oligarthra*, female: a, maxillary palp; b, antennal segments; c, wing (macrotrichia omitted); d, spermathecae.

*Male*: According to Saunders, body length 1.4 mm., wing 0.9 mm. by 0.26 mm., sternite 9 short, width slightly more than twice length, aedeagus broadly shield-shape with lateral lobed expansions, parameres H-shape, with caudal lobes normal, curved, spoon-like, but notched and double pointed at tips, coxites narrow, styles as long as coxites, with blunt, curved tips.

**DISTRIBUTION**: Puerto Rico, British West Indies, British Guiana, Mexico, Cuba, Caroline Is.

**PALAU. BABELTHUAP**: Ngiwal, female, light trap, May 21, 1957, Sabrosky.

The male of this species is not known from Micronesia as yet. It seems peculiar to us that the type localities are in tropical America, far from Micronesia, but the female is identical with Saunders' description and text figures, except for negligible differences. Saunders has studied all immature forms and both sexes and has given brief but accurate descriptions.

35. *Forcipomyia* (*Trichohalea*) *sabroskyi* Tokunaga, n. sp. (fig. 36).

Small, brown and yellow; scales of legs, wing, abdomen and other parts absent. Male with empodia highly reduced, represented only by two hair-like structures and claws bifid at tips, three antennal segments from 11 to 13 subequal in shape and length, hind TR about 2.79, hypopygium with H-shape fused parameres; aedeagus broad, shield-like, but round on caudal margin and with pair of dark processes on tergal side finely forked at tips, arising from lateral corners of base, and convergent caudad.

*Male*: Body about 1.43 mm. long. Wing about 0.87 mm. by 0.27 mm. General coloration brown, scutellum yellow and legs more or less yellowish.

Head brown, with eyes contiguous above, proboscis shorter than half of length of head capsule (10:23), clypeus with eight to 12 setae. Maxillary palp rather slender, with segment 3 somewhat fusiform and with rather small sensory pore at middle, five segments

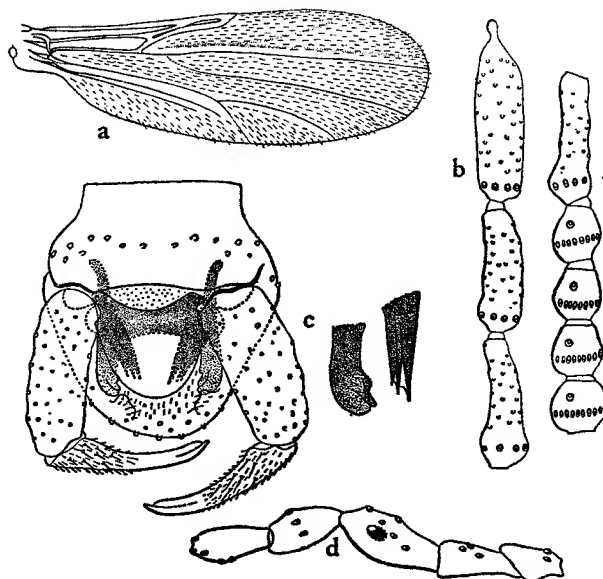


FIGURE 36.—*Forcipomyia* (*Trichohalea*) *sabroskyi*, male: a, wing; b, distal eight antennal segments; c, hypopygium, distal end of caudal lobe of paramere, and inner forked sclerite of aedeagus; d, maxillary palp.

with relative length of 7:10:19.8:8.5:10.5. Antenna entirely brown, with three penultimate segments subequal to each other in shape and length; combined proportional length of segments 2 to 10 and 11 to 14 about 81.5:76.8 and relative length of distal eight segments about 7.5:7.3:7.7:7.3:16.7:17.8:17.2:24.

Thorax mainly brown, scutellum yellow, with six strong bristles along caudal margin and five to 11 small hairs. Legs yellowish pale brown, but last segments more brownish; claws distinctly arcuate, slender, and bifid at tips, empodium represented by pair of delicate hairs; hind leg with tibial comb consisting of five or six distal bristles and TR about 2.79, from 2.7 to 2.82; leg segments, except for basal two, with proportional length about 97:96:53:20.5:17.3:15.3:17 in fore, 110.3:106:52:20.5:17.3:15.5:15.3 in middle, and 110.5:103:61.5:21.8:18.5:15.5:15.8 in hind leg.

Wing very pale brown, with bare areas along veins not distinct. Venation: Costa ending beyond middle of wing length (38.5:67.2) and little or just before level of tip of  $Cu_1$ , relative length of R, M, and stem of  $mCu$  about 17:15:29.7,  $R_s$  little shorter than twice of  $R_1$  (13.8:7.7), first radial cell very narrow or slit-like, second cell narrow and as long as first (6:5.8),  $M_{1+2}$  subequal to r-m, base of  $M_1$  atrophied,  $mCu$  slightly before level of tip of  $R_s$ ,  $M_{3+4}$  about twice of  $Cu_1$  (18.7:8.8). Haltere pale brown.

Abdomen brown; hypopygium with styles and coxites very slender, parameres H-shape and with somewhat spoon-like projections; aedeagus broad, shield-like, but round on caudal margin and with pair of dark processes on tergal side finely forked at tips, arising from lateral corners of base, and convergent caudad; sternite 9 transverse, twice as broad as long, and with band of setae on middle part, caudal membrane without spinules; tergite 9 round on caudal margin; coxites slender, cylindrical, and about twice as long as wide (34:17.3); styles slender, claw-like, and as long as coxites (33.7:34). Aedeagus shield-shape, with basal arch very low, two basal roots stout and caudal margin round, and with pair of convergent chitinized processes arising from lateral ends of base and showing fork-like structure at tips; parameres H-shape, connected by bar at middle, with basal apodemes rather slender, caudal lobes round at apices, and each with finger-like minute process before apex.

*Female:* Unknown.

Holotype, male (US 64596), Ngaremlengui, Babelthuap I., Palau Is., light trap, June 1, 1957, Sabrosky. Paratypes, two males (US), with holotype; male (BISHOP), Mutunlik, Kusaie, 22 m., Mar. 21, 1953, Clarke.

DISTRIBUTION: Caroline Is. (Palau, Ponape, Kusaie).

This species is very closely allied to *F. (T.) edwardsi* Saunders (Brazil). The allied species is different in the following points from the Micronesian one: In the male, the body is larger, about 1.8 mm. long and wing about 1.2 mm. by 0.3 mm.; the basal segment of the distal four antennal segments is longest, their proportional length 12:10:9:11; tarsal segment 1 of the hind leg is little longer than 2 to 4 ( $21=8+7+5$ ); hind TR is a little smaller, 2.63; and the caudal lobes of the parameres are short, subtriangular, and pointed.

### 36. *Forcipomyia (Trichohelea) hamaticauda* Tokunaga, n. sp. (fig. 37).

Small, dark brown, with peculiar processes of aedeagus. In male maxillary palp with very shallow sensory pore on segment 3; antennal segment 11 as long as 12 and with several suberect setae on one side; tarsal claws finely bifid only at apices, empodia absent, hind TR 2.9-3.1; scutellum with six strong bristles and several minute hairs; wings with bare areas along veins obscure, costa extending beyond middle of wing; hypopygium highly specific, especially in structure of aedeagus: Aedeagus longer than wide, with pair of dark apical processes arising from lateral parts of basal arch; parameres with caudal lobes short, stout and somewhat irregularly round at tips; coxites and styles subequal in length, both slender and the latter sharply pointed.

*Male:* Body length about 1.59 mm. Wing about 0.98 mm. by 0.26 mm. General coloration dark brown.

Head almost entirely brown, but mouthparts somewhat paler; eyes contiguous above, and very finely pubescent on frontal aspect; proboscis slender and about half as long as height of head capsule; clypeus with about 12 scattered setae. Maxillary palp slender, segment 3 with several hair-like sensillae in very shallow depression at middle of segment, with five segments in proportion of 5:9:15:8:8. Antenna brown, relative length of segments 2 to 10 and 11 to 14 together about 84:81.5, those of distal eight about 8:8:8:8:20:20:17.5:22; 11 with several suberect setae on one side and as long as 12; last three segments with fine reticular relief on surface.



Thorax entirely dark brown, scutum without paler spots or stripes, scutellum with six strong bristles arranged in line along caudal margin and several minute setae on middle part. Legs entirely fuscous brown, paler than thorax, without scales; claws slender, slightly bifid at apices, empodia absent and replaced by double thread-like hairs arising from bases of claws; tibial comb of hind leg with six apical bristles and hind TR 2.91-3.05; leg segments, except basal two, about 95:96:55:20:17:15.5:15 in fore, 107:105:53:21:17:16:14 in middle, and 112:103:64.5:22:17:15:13.5 in hind leg.

Wing with veins brown, bare areas along veins obscure. Venation: Costa ending little beyond middle of wing (40:75), relative length of R, M, and stem of fMCu about 19:17:32.5, Rs about 1.7 times as long as  $R_1$  (12:7), first radial cell absent, second cell distinct, rather long, but shorter than its stem (6.5:5),  $M_{3+4}$  little longer than twice  $Cu_1$  (22:10), fMCu just before level of base of second radial cell. Haltere brown.

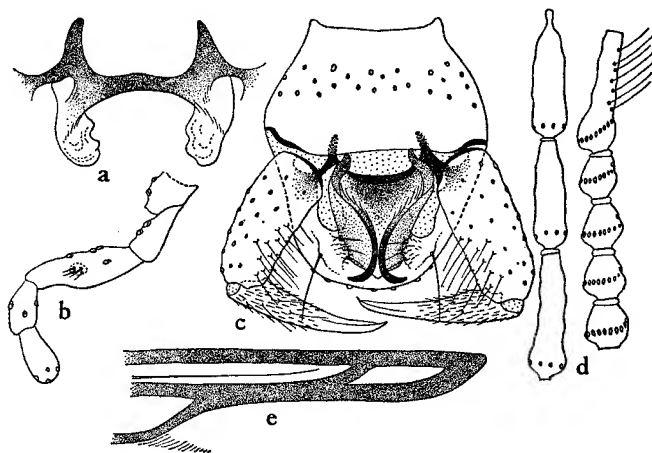


FIGURE 37.—*Forcipomyia* (*Trichohalea*) *hamaticauda*, male: a, parameres; b, maxillary palp; c, hypopygium; d, distal eight flagellar antennal segments; e, stigmal area of wing.

Abdomen with tergites brown, sternite reduced into hemisternites and very pale, pleural membranes fuscous and pale brown. Hypopygium dark brown; tergite 9 somewhat round on caudal margin; sternite 9 much shorter than wide (22:44) and without caudal incision; coxites slender, cylindrical, about 2.6 times width (31:12) and with many setae on distal parts of mesal sides; styles as long as coxites (30:31), slender and sharply pointed; aedeagus longer than basal width (25:20), with basal arch about one-fifth of total length, pair of apical curved processes which arise from lateral basal parts, extend caudad undulately and diverge at tips; parameres with bases and cross bar dark and caudal lobes hyaline, stout and with caudal ends irregularly round.

*Female:* Unknown.

Holotype, male (US 64597), Melekeiok, Babelthuap I., Palau Is., May 22, 1957, light trap, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau).

This species is quite specific in the structure of male hypopygium. *F. (T.) jocosus* Saunders from Trinidad bears a somewhat similar aedeagus, but the apical processes of the aedeagus are much shorter, the caudal lobes of parameres

are somewhat spoon-like and pointed at tips, the styles are flattened at tips and distinctly shorter than coxites, the last two segments of the maxillary palp are completely fused, forming a single segment, TR of hind leg is about 2.4, and the empodia are well developed, highly differing from the new species.

### Subgenus A

TR 3.3-3.73. Basal flagellar segments of female antenna flattened and gradually elongate distally, segments 8 and 9 spherical, apical five segments distinctly longer than preceding one. Maxillary palp five-segmented. Wings unadorned, with costa extending beyond middle of wing, with rather distinct bare areas along veins, first radial cell absent and second cell opened and shorter than its stem. Single spermatheca. Male unknown.

This subgenus is closely allied to *Trichohalea*, in the structure of female antennae and the venation of wings, but highly differing from the allied subgenus in the number of spermathecae and the larger value of hind TR.

### 37. *Forcipomyia* (subgen. A) *carolinea* Tokunaga, n. sp. (fig. 38).

Small, dark brown or brown, with female AR about 1.22 and hind TR about 3.44. In female, maxillary palp with several spoon-like sensillae in shallow, common, sensory pore at middle of segment 3; antenna with basal segments 2 to 7 or 8 more or less flattened and discoidal, segments 8 or 8 and 9 spherical, each with two slender long sensillae and two or three small sensillae, distal five segments obviously elongate. Thorax entirely brown, scutellum with six large setae along caudal margin. Wing with costa ending distinctly beyond middle of wing, second radial cell distinct, but shorter than its stem. Single spermatheca, round; subgenital plate with very slender ring part and wing-like arms.

*Female*: Body length about 1.42 (1.26-1.53) mm. Wing about 0.852 mm. by 0.3 mm. General coloration brown to dark brown.

Head almost entirely brown, with mouthparts rather paler, eyes contiguous above, proboscis about half as long as height of head capsule (10:19.3); clypeus with 13 or 14 scattered setae. Maxillary palp rather stout, 5-segmented (5:7:14.5:8:7.7); segment 3 with group of spoon-like sensillae in very shallow sensory pore at middle of segment. Antenna with basal short segments discoidal basally and spherical distally, distal five segments obviously more elongate than basal short segments, AR about 1.22 (1.17-1.26), with segments, except basal three, in proportion of 5.3:5.8:6:6.5:6.8:7:10.8:10.8:11.8:19 (width about 8 to 7 units and in last segment 8 units), each short basal segment with two slender and two or three smaller trichoid sensillae beside six or seven verticils.

Thorax almost uniformly dark brown or brown, scutellum with six long bristles arranged in line along caudal margin and eight to 14 minute hairs on anterior half. Legs yellowish pale brown, without scales, claws rather thick, empodia as long as claws, hind tibial comb with five apical bristles, hind TR large, about 3.44, from 3.3 to 3.73. Leg segments, except for basal two, about 86.5:87:49.5:17.8:14.5:12:13.5 in fore, 98:100.5:50.5:18.5:14.5:12.8:13 in middle, and 103.5:98:66:19.5:15.5:13.5:14 in hind leg.

Wing unadorned, without scales, bare areas along veins rather distinct, veins brownish. Venation: Costa ending distinctly beyond middle of wing (36.2:65.3) and above tip of  $Cu_1$ ,  $R_s$  about 1.6 times as long as  $R_1$  (13.3:8.3),  $R$ ,  $M$ , and stem of  $fMCu$  about 15.3:13.7:26.8 in proportional length, first radial cell absent, second cell subtriangular and distinctly shorter than its stem (4.5:7.7),  $M_2$  broadly atrophied basally,  $fMCu$  at level of middle of second radial cell or just before it,  $M_{3+4}$  little longer than twice of  $Cu_1$  (20.3:9). Haltere pale brown.

Abdomen with tergites brownish and subsquare, sternites reduced into very pale membranes similar to pleural membranes; cerci pale brown; single spermatheca, brown,

round (2.5+17 by 15 units), with pale punctures and short neck-part of duct; subgenital plate with slender ring part and lunate, wing-like, lateral arms.

*Male*: Unknown.

Holotype, female (US 64598), Melekeiok, Babelthuap I., Palau Is., May 22, 1957, Sabrosky. Paratypes, Palau: Female (BISHOP), Koror I., Dec. 5, 1952, Gressitt; female, Koror, May 30, 1957, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau).

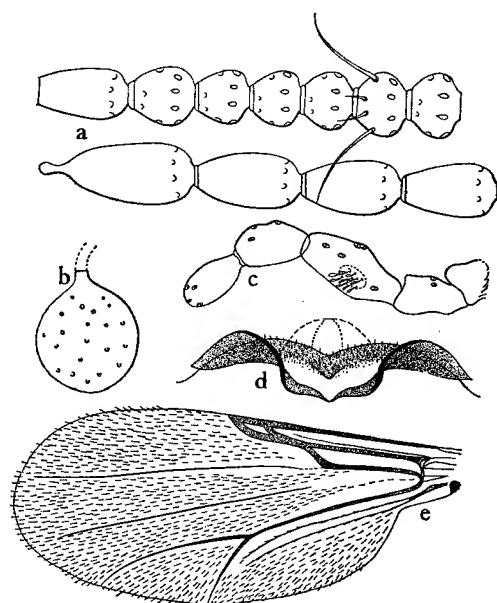


FIGURE 38.—*Forcipomyia* (subgen. *A*) *carolinea*, female: a, distal ten flagellar antennal segments; b, spermatheca; c, maxillary palp; d, subgenital plate; e, wing.

This female somewhat resembles *F. (Trichohalea) caribearia* Saunders known from British Guiana and British West Indies, in the structure of the antenna, maxillary palp, and wing, but these two females are distinctly different in the number of spermathecae and the value of hind TR. Another allied species may be *F. (Proforcipomyia) yapensis* Tokunaga and Murachi, which is also highly different in the following points: The maxillary palp is provided with a rather deep sensory pore, the first radial wing cell is present and slit-like, there are two spermathecae, and the hind TR is about 1.57.

### Subgenus B

General features very closely similar to those of *Proforcipomyia*, especially in the structure of male hypopygium and female antenna. However, spermatheca single, and TR of hind leg smaller, 0.8-1.3, distinctly differing from *Proforcipomyia*.

Subgenus *A* is somewhat similar to subgenus *B*, but these two distinctly differ in the following points: TR larger than 3.0 in *A* and smaller than 1.3 in *B*; basal flagellar segments of female antenna discoidal to spherical and each segment with five sensillae in *A* and short-oval and each with many sensillae in *B*; female wing without first radial cell in *A* and with it (slit-like) in *B*; and legs without scales in *A* and with one-striped slender scales on tarsi in *B*.

38. *Forcipomyia* (subgen. *B*) *fuscimanus* (Kieffer). (Figure 39.)

*Ceratopogon fuscimanus* Kieffer, 1921, Philippine Jour. Sci. 18: 557 (Formosa).

*Forcipomyia fuscimanus* (Kieffer), Tokunaga, 1940, Tenthredo 3 (1): 82 (Truk); 1941, Annot. Zool. Japon. 20 (2): 109.

Rather small, pale yellowish-brown, segment 3 of maxillary palp slender, slightly swollen basally, with group of spoon-like sensillae, and without common sensory pore. In female, antenna brown, AR about 1.08, hind TR about 1.16, wing with costa extending far beyond middle of wing and two radial cells present, spermatheca single and somewhat pyriform. In male, hind TR about 0.83, wing with costa rather short ending at about middle of wing, hypopygium without median lobes of parameres, basal arms of parameres somewhat V-shape and widely opened distally, aedeagus elongate, triangular and with two minute processes at caudal tip.

*Female*: Body about 1.82 mm. long. Wing about 1.08 mm. by 0.45 mm.

Head with vertex brown, other parts mainly yellowish pale brown, eyes broadly contiguous above; clypeus with about 12 to 19 setae. Maxillary palp slender; segment 3 slender, basal half slightly swollen ventrad, with spoon-like sensillae on this area, and without common sensory pore, distal half much more slender than other segments; five segments in proportion of 9.8:12.4:26.3:13.8:7.4. Antenna brown, basal flagellar segments almost entirely short-oval and distal five distinctly elongate and cylindrical; basal flagellar segments each with about ten verticils and two long, three small, hair-like and three peg-like sensillae. AR about 1.08 (1.0-1.13); distal eight segments in proportion of 10.8:11.3:12.3:17.4:18.2:18.9:18.8:25.6.

Thorax mainly yellowish pale brown; scutum with anterior margin broadly more brownish, subconfluent median vittae of caudoscuteal area yellow and lateral margins yellow; scutellum with ten strong bristles and three small median setae along caudal margin and about 25 to 28 small and minute setae on anterior half. Legs almost entirely yellow, but tarsal segments more or less fuscous due to thick dark-brown hairs; claws rather large and thickened preapically; scales very much reduced, hair-like. TR about 1.44 in fore leg, 1.05 in middle leg, and 1.16 (1.06-1.24) in hind leg; legs with distal seven segments in proportion of 115.8:113.5:51.3:32.7:21.3:19.3:17.2 in fore leg, 135.7:145.5:42:40:24.3:19.8:16.4 in middle leg, and 140:134:54.5:46.7:30.3:23.6:18.5 in hind leg.

Wing yellowish gray, with costal and radial hairs pale brown, other hairs yellowish pale brown. Venation: Costa produced beyond end of  $R_s$  and ending far beyond middle of wing (50.4:84.4),  $R_s$  a little shorter than twice  $R_1$  (21:12) and much longer than  $R$  (21:17.7), two radial cells well developed but narrow, second radial cell about 1.4 times as long as first cell,  $r-m$  subequal to  $M_{1+2}$ , base of  $M_2$  obscure,  $fMCu$  under second radial cell,  $Cu_1$  ending at level of costal end. Haltere yellowish pale brown.

Abdomen with tergites and sternites pale brown and not reduced, pleural membranes yellowish pale brown, hairs all yellow; cerci yellow; subgenital plate with median ring part broad and widely opened and lateral arms not distinctly broadened; spermatheca single, brown, pyriform, about 21.8 by 15.4 units and without distinct chitinized duct.

*Male*: Body about 2.16 mm. long. Wing about 1.27 mm. by 0.37 mm. General coloration similar to that of female.

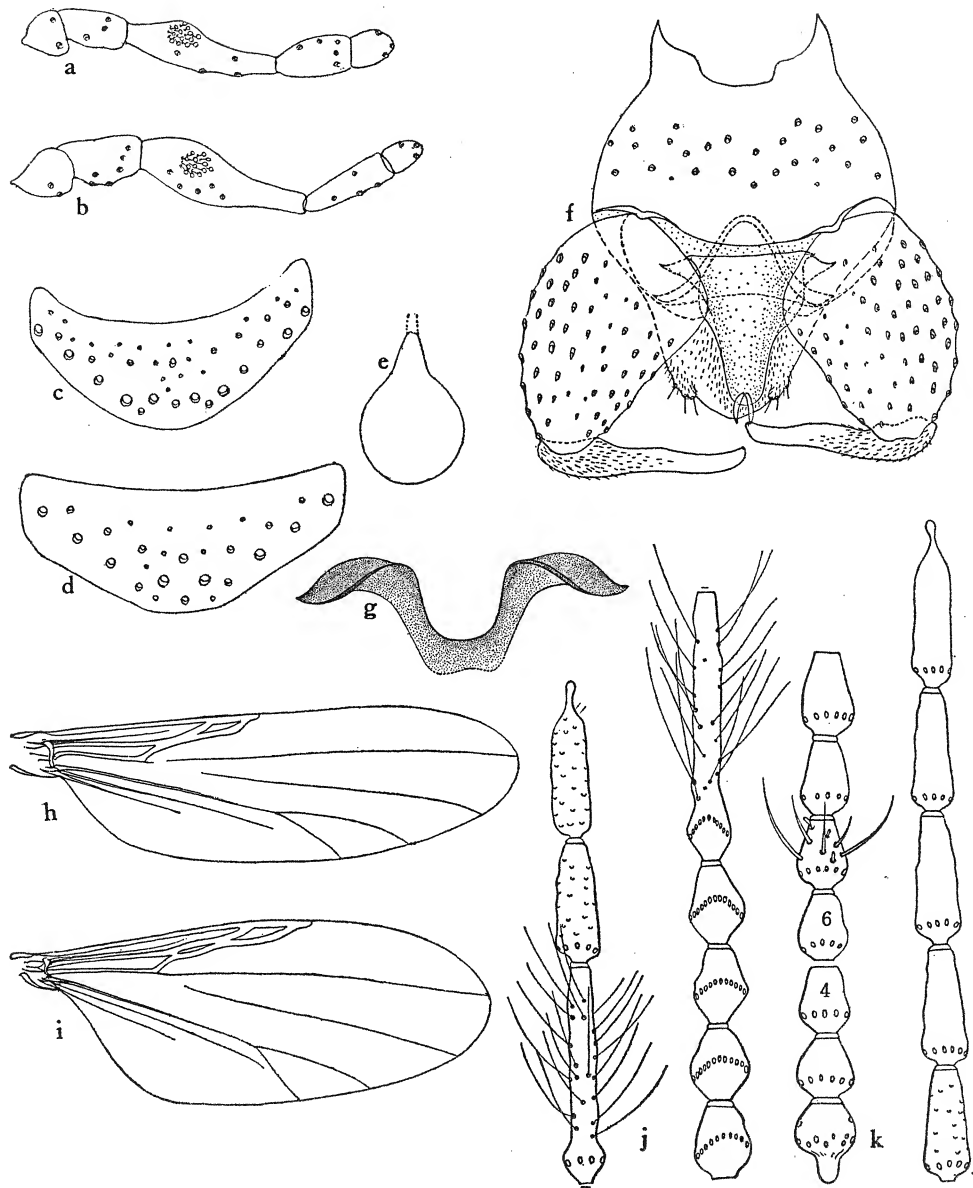


FIGURE 39.—*Forcipomyia* (subgen. *B*) *fuscimanus*: a, maxillary palp, female; b, maxillary palp, male; c, scutellum, female; d, scutellum, male; e, spermatheca; f, hypopygium, male; g, subgenital plate; h, wing (hairs omitted), male; i, wing (hairs omitted), female; j, distal eight flagellar antennal segments, male; k, distal nine and basal three flagellar antennal segments, female.

Head with vertex brown, other parts mainly pale brown; clypeus with about ten to 15 setae. Maxillary palp similar to that of female, with five segments in proportion of about 7.8:12.6:30.4:13.8:8.5; segment 3 without common sensory pore. Antennae brown; proportion of segments 2 to 10, 2 to 11, 2 to 12, 11 to 14, 12 to 14, and 13 to 14 about 138.3:185:218.1:130.5:83.8:50.6; distal eight segments in proportion of 13.2:13.6:14.3:16.2:46.2:33.3:22.2:25.6; segments 11 and 12 (fig. 39) with many strong bristles scattered along entire length.

Thorax mainly pale brown, but scutum with anterior margin broadly brown and paired lateral brown vittae along lateral sides of foveae; scutellum with eight strong bristles and five small median setae along caudal margin and about 14 small minute setae on anterior half. Legs yellowish pale brown, with hairs pale brown, with slender one-striped scales on tarsal segments; claws rather large and slender; TR about 1.11 in fore leg, 0.65 in middle leg, and 0.83 (0.81-0.91) in hind leg; proportion of leg segments, except for coxae and trochanters, about 124.3:127.3:51:43.7:28.3:23.7:17 in fore leg, 145.7:152.7:36.7:55.3:33.3:25:16 in middle leg, and 151.3:147.7:51:60.3:40.7:28:16.7 in hind leg.

Wing pale yellowish gray, with costal and radial hairs pale brown; bare areas along veins absent. Venation: Costa slightly beyond tip of  $R_s$  and ending at middle of wing (48.6:97),  $R_s$  about 1.5 times as long as  $R_1$  and about 0.68 as long as  $R$  (15.1:10.2:22.3), first radial cell absent, second radial cell shorter than stem (24:31.8),  $M_{1+2}$  and base of  $M_2$  obscure, fMCu just beyond level of tip of costa. Haltere pale brown.

Abdomen brown, without scales. Hypopygium more brownish with brown setae; sternite 9 about twice as broad as median length (44:20.5) and its caudal margin slightly convex; tergite 9 subtriangular, but caudal end round and ending far before tips of coxites. Coxites broad at base, tapered, and about 1.5 times as long as basal width (37.5:25); styles shorter than coxites (32.5:37.5), rather slender, almost straight, not tapered, and ending in blunt tips. Aedeagus subtriangular, rather long, about 1.3 times as long as basal width, with pair of minute horn-like processes at tip and basal angles short and pointed laterad; parameres without median lobes but with basal arms, which are connected, forming a widely opened V-shape slender belt and ending at dorsal bases of coxites.

DISTRIBUTION: Formosa; Mariana, Caroline, Marshall Is.

S. MARIANA IS. ROTA: Female, June 1946, Townes.

PALAU. KOROR: Four females, at light, Apr. 1953, Beardsley.

CAROLINE ATOLLS. KAPINGAMARANGI: Werua I., male, July 1954, Niering.

TRUK. WENA (Moen): Seven females, two males, 30 to 180 m., June-July, 1946, Townes.

PONAPE. Nanipil, Net Distr., female, male, Feb. 1948, Dybas; Peipalap Pk., 150 m., Sokehs I., male, June-Sept. 1950, Adams; hydroelectric plant near Colonia, female, four males, Aug. 1946, Townes; Agric. Exper. Sta., light trap, female, male, Jan. 1953, Gressitt; Mt. Temwetemwensekir, male, Jan. 1953, Gressitt; south of Nanpohnmal, two females, Jan. 1953, Clarke.

KUSAIE. Lele I., male, Dec. 1937, Esaki; Mt. Tafeayat, seven females, ten males, Aug. 1946, Townes; Mutunlik, 19 females, 25 males, Jan. 1953, Gressitt; Mutunlik, 14 females, two males, 22 m., Jan. 1953, Clarke; Mutunlik, 15 males, Mar. 1953, Clarke; Hill 541, male, Mar. 1953, Clarke; Hill 1010, four males, Apr. 1953, Clarke; Mwot, two males, Apr. 10, 1953, Clarke.

MARSHALL IS. AILINGLAPALAP: Bikajela I., male, Aug. 1946, Townes.

OF WING (JOINT COST),  $R_s$  A SLIGHTLY BEYOND TIP OF  $R_s$  AND ENDING AT MIDDLE OF WING (21:17.7), two radial cells well developed but narrow, second radial cell about 1.4 times as long as first cell, r-m subequal to  $M_{1+2}$ , base of  $M_2$  obscure, fMCu under second radial cell,  $Cu_1$  ending at level of costal end. Haltere yellowish pale brown.

Abdomen with tergites and sternites pale brown and not reduced, pleural membranes yellowish pale brown, hairs all yellow; cerci yellow; subgenital plate with median ring not broad and widely opened and lateral arms not distinctly broadened; spermatheca

## Subgenus C

Minute. Male hypopygium similar to that of *Proforcipomyia*, parameres represented only by basal arch and no trace of lobes, but basal arch of parameres plate-like and flattened horizontally. Single spermatheca. Flagellar segments of female antenna, except last one, almost entirely similar in shape and size, short-oval and no abrupt change between basal and distal segments; segments 2 to 9 each with two long, one small and one minute sensory hair. Male antennal segments 13 and 14 thicker, 11 and 12 with several strong bristles scattered on middle parts and 11 longest. TR of hind leg 1.66-1.89. Maxillary palp with last two segments completely fused. Wing with costa hardly extending at middle of wing and unadorned. Legs with slender scales on tarsal segments.

General features of this provisional subgenus are similar to *Synthyridomyia*, especially in the structure of female antenna and the number of spermathecae, but these two subgenera differ obviously in the structure of the male hypopygium, the value of hind TR, and the segmentation of the maxillary palp.

**39. *Forcipomyia* (subgen. C) *deminuta* Tokunaga and Murachi, n. sp. (fig. 40).**

Small, yellowish or pale yellowish brown; scutum without vittae or pale spots; maxillary palp rather slender, three-segmented, segment 2 with sensory pores at middle, and ultimate two segments fused; female AR about 0.78; scutellum with six strong bristles along caudal margin; legs with slender scales, first hind tarsal segment somewhat compressed, hind TR about 1.68 in female and 1.76-1.89 in male; wing without scales. In female, spermatheca single and with curved chitinized duct and in male, coxite and style slender and long, parameres somewhat V-shape, broad, and without median lobes.

*Male:* Body length about 1.35 mm. Wing about 0.8 mm. by 0.24 mm.

Head pale brown, with vertex more brownish, mouthparts yellowish pale brown, proboscis shorter than half of vertical length of head; clypeus with six to eight setae. Maxillary palp with segment 1 obscure, ultimate two segments fused, thus apparently three-segmented (9:15:14.1), segment 2 rather slender, basal two-thirds slightly swollen and with rather deep sensory pore at middle. Antenna with scape yellowish pale brown on ventral half and more brownish on dorsal half, flagellar segments and plumose hairs pale brown, but distal four segments slightly more brownish; segment 11 longest and with several strong scattered bristles on middle part, similarly in 12, last two segments much wider than preceding two and somewhat oval; distal eight segments in proportion of 8.4:8.5:8.8:9.1:26:18.5:12.3:17.1; and ultimate segment with small terminal stylet.

Thorax almost entirely yellow or pale brownish yellow, but scutum with median brownish cloud along cephalic margin; scutellum with six strong bristles in line along caudal margin and with two to four small accessory median setae. Legs all pale brownish yellow, with one-striped, slender scales on tarsal segments; hind basitarsus somewhat compressed on basal half; TR about 2.39 in fore leg, 1.81 in middle leg, and 1.81 (1.76-1.89) in hind leg; leg segments, except for basal two, in proportion of 74.3:74:34.3:14.3:13:12.2:10.3 in fore leg, 84:91.2:29.3:16.2:14.8:12.7:10.3 in middle leg, and 84.7:83:37.7:20.8:18.3:14.7:10.8 in hind leg; empodia as large as claws.

Wing with anal lobes almost absent, pale brownish gray, rather thickly clothed with long hairs, without scales, no bare areas along veins, anterior veins pale yellow. Venation: Costa slightly produced beyond tip of Rs and ending a little before middle of wing (28.8:61.1), Rs about 0.73 as long as R and about 1.5 times as long as R<sub>1</sub> (9.8:13.5:6.7), first radial cell absent, second cell small, triangular, and much shorter than stem (12.3:24), stem of fMCu fully twice as long as R (27.7:13.5), fMCu under or a little beyond costal tip, M<sub>2</sub> absent entirely, Cu<sub>1</sub> very much reduced and obscure. Haltere entirely yellow.

Abdomen very pale brownish yellow, without scales. Hypopygium pale brown; sternite 9 broad on posterior margin which is almost twice anterior width (26:12), with length

about 0.6 of caudal width (16:26), caudal margin slightly undulate; tergite 9 somewhat triangular, half as long as basal width, with caudal margin rounded. Coxite large, produced far beyond caudal end of tergite 9, about twice as long as basal width (26.6:12.8); style very slender, slightly tapered, almost straight, a little shorter than coxite (22:26.6). Aedeagus small, subtriangular, with caudal process small and rounded, basal angles bluntly produced laterad, basal arch absent; parameres without median lobes, lateral arms V-shape, fully as long as aedeagus, median fused part of two arms broad, each arm with small pointed process near junction to base of coxite.

*Female*: Body length about 1.06 mm. Wing about 0.62 mm. by 0.25 mm. Coloration closely similar to that of male.

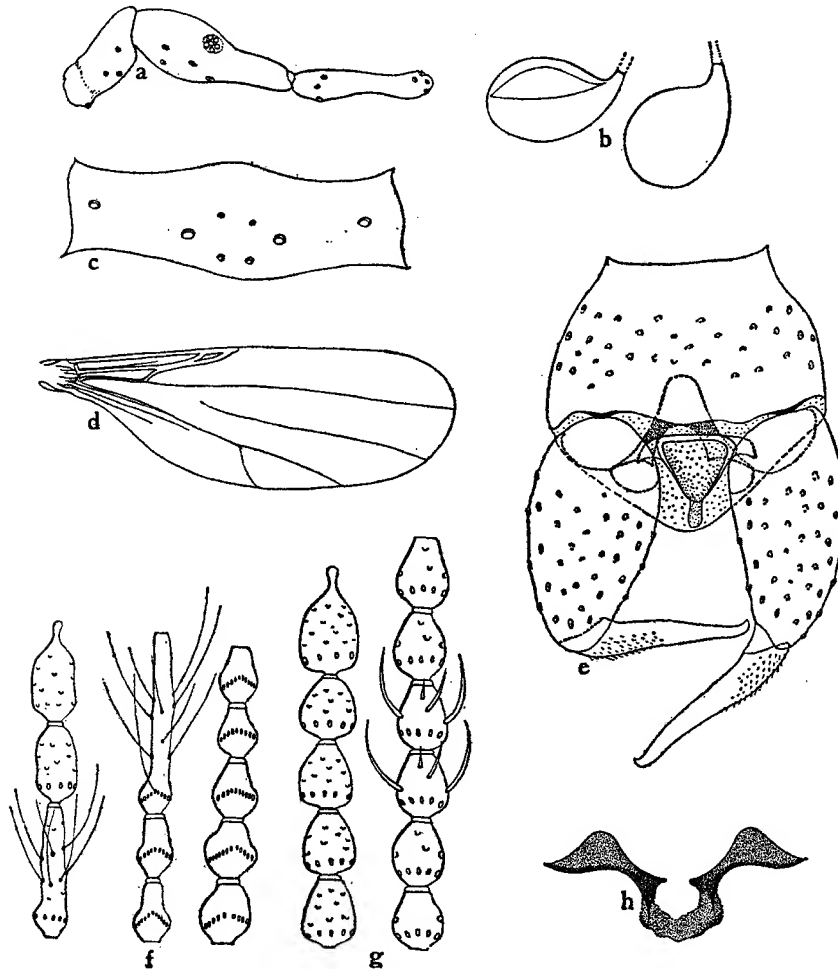


FIGURE 40.—*Forcipomyia* (subgen. *C.*) *diminuta*: a, maxillary palp, male; b, spermathecae; c, scutellum, male; d, wing (hairs omitted), male; e, hypopygium, male; f, distal 11 flagellar antennal segments, male; g, distal 11 flagellar antennal segments, female; h, subgenital plate.



Head with eyes bare and almost contiguous above; clypeus with about four to six setae. Maxillary palp apparently three-segmented (8:14:10.8); segment 2 rather slender, slightly swollen on basal half, and with very shallow sensory pore at middle, last segment slightly constricted at middle, showing fusion of two segments as in male. Antenna with scape brownish and flagellar segments paler brown; flagellar segments, except ultimate, subequal in shape and size, short-oval, segments 2 to 9 with two long and two small sensory hairs, distal segments 10 to 13 not distinctly different from basal segments in shape; ultimate segment oblong and large; AR about 0.78 (0.76-0.79); distal eight segments in proportion of 7.5:7.5:8.8:9:8.5:8.5:8:12.5.

Thorax almost entirely yellow, caudoscuteal area pale yellow, median anterior margin of scutum somewhat brownish; scutellum with six strong bristles and two or three small median setae. Legs entirely yellow, tarsi rather densely clothed with two- or three-striped scales, claws yellowish brown and slender; TR about 2.2 in fore leg, 1.71 in middle leg, and 1.68 (1.66-1.71) in hind leg; proportion of leg segments, except for coxae and trochanters, about 58.5:61:27.5:12.5:11.8:10.8:10.3 in fore leg, 69:80:24:14:12.5:10.5:9.8 in middle leg, and 69.8:71:29.5:17.5:14.5:12.3:10 in hind leg.

Wing short and oval, with macrotrichia spread all over surface and bare areas along veins obscure or absent, costal and radial veins yellow. Venation: Costa ending little before middle of wing (23.5:49), Rs about as long as R and hardly twice as long as  $R_1$  (9.5:9.5:5), first radial cell absent, second subtriangular and about two-thirds as long as stem (14.5:21), stem of fMCu about twice as long as R, fMCu under tip of costa,  $M_2$  completely absent,  $Cu_1$  very much obscure. Haltere yellow.

Abdomen all yellow and without scales; cerci yellow; spermatheca single, oval, brown, with slightly curved neck part, 15.3 by 12 units; subgenital plate with basal ring rather thick and somewhat round, lateral arms subtriangular and wing-like.

Holotype, male (US 64030), Mt. Temwetemwensekir, Ponape, 180 m., Jan. 19, 1953, Gressitt. Allotype, female (US), same place as for holotype, Jan. 11-16, 1953, Gressitt. Paratypes, male (CM), Ulimang, Babelthup I., Palau Is., Dec. 9, 1947, Dybas; female (BISHOP), two males, Mt. Temwetemwensekir, Ponape, Jan. 11-16, 19, 1953, Gressitt.

Other specimen, male, Koror I., Palau Is., July 24, 1957, Sabrosky.

#### Subgenus *Lasiohelea* Kieffer (1921).

*Centrorhynchus* Lutz, 1913, Inst. Oswaldo Cruz, Mem. 5:62 (not Steven, 1829).

*Lasiohelea* Kieffer, 1921, Inst. Pasteur Afrique N., Archiv. 1:115.

Basal flagellar segments of female antenna discoidal, subspherical or short-oval, and without neck parts; distal five segments cylindrical and distinctly longer than segment 9. Maxillary palp distinctly five-segmented and segment 3 with sensory pore or scattered sensillae. Female hind TR usually larger than 2.0 and less than 3.0, male TR somewhat smaller than in female; empodium and claws normal. Wing unadorned, with rather dense macrotrichia, lying less closely than in subgenus *Forcipomyia*, bare areas adjoining veins distinct; costal vein extending distinctly beyond middle of wing, Rs extending closely along costa, first radial cell slit-like or obliterated, second radial cell usually far longer than first. One spermatheca. Male hypopygium with styles somewhat thickened apically or pre-apically, parameres slender, arch-like and without caudal lobes as in subgenus *Proforcipomyia*; aedeagus complicated, subdivided into pair of recurved sclerites, each of which bears apical strong hook-like process, highly differing from all other subgenera.

In this paper, I have recognized *Lasiohelea* and separated it from *Euforciomyia*. The following subgeneric characters of *Lasiohelea* are thought to be most important: The long and very narrow second radial cell of female wing; the paired hook-like sclerites of aedeagus; and the simple arch-like parameres of male hypopygium. Consequently some species which have been classified in *Lasiohelea* are removed from this subgenus since they do not coincide with the diagnosis. Thus *F. pectinunguis* de Meijere, *F. esakii* Tokunaga, etc., are eliminated. There are four species of *Lasiohelea* known from Micronesia: *F. (L.) stimulans* de Meijere, *carolinensis* Tokunaga, *spinipenis*, n. sp., and *ancoriformis*, n. sp., which are distinguished by the following key.

#### KEY TO MICRONESIAN SPECIES OF LASIOHELEA

1. Hind legs with TR smaller than 2.0. Male hypopygium with paired sclerites of aedeagus bearing two preapical strong or minute accessory processes..... 2  
Hind legs with TR larger than 2.0. Male hypopygium without preapical processes in addition to apical ones..... 3
2. Paired sclerites of aedeagus with minute caudal spine-like accessory processes directed backward. Female unknown.....43. *spinipenis*  
Paired sclerite of aedeagus with two pairs of long preapical processes strongly recurved forward.....40. *carolinensis*
3. Male hypopygium with arch of parameres deep and round at middle and paired sclerites of aedeagus slender and with apical projections triangular....41. *stimulans*  
Male hypopygium with arch of paramere broad, shallow and subsquare at middle and paired sclerites of aedeagus stout and with apical projections horn-like. Female unknown.....42. *ancoriformis*

#### 40. *Forcipomyia (Lasiohelea) carolinensis* Tokunaga (fig. 41).

*Lasiohelea carolinensis* Tokunaga, 1940, Philippine Jour. Sci. 71 (2): 208 (Kusaie).

Small, yellowish; maxillary palpal segment 3 rather short with scattered sensillae on mesal side of apical half; antenna mainly brown; hind TR about 1.91 in female and 1.7 in male; wing with costa extending far beyond middle of wing and second radial cell long and very narrow. Male hypopygium with basal arms of parameres slender and widely opened in U-shape, without mesal lobes of parameres; aedeagus consisting of paired sclerites, each with two strong spines on apical part.

*Female*: Body about 1.23 mm. long. Wing about 0.82 mm. by 0.34 mm.

Head dark brown to brown, sometimes dark yellow, with eyes bare and broadly contiguous above; clypeus with about 12 to 13 setae. Maxillary palp and mouthparts mainly brown; palp rather short, segment 3 with scattered sensillae on mesal side of apical part, five segments in proportion of 5.6:8.6:10.8:6.7:9.4. Antenna with scape dark brown, other segments all brown; segments 2 to 4 somewhat flattened and discoidal, 5 to 7 subspherical, 8 to 9 slightly longer than wide, 10 to 13 elongate and about three times as long as basal width, 14 longest, about four times as long as basal width, and with small terminal stylet; AR about 1.61 (1.50-1.96); proportion of distal eight segments about 6.8:7:8.1:17.2:18.1:18.9:18.5:25.2.

Thorax yellowish brown, with brown setae; scutellum with six strong bristles and three smaller setae along caudal margin and with 12 to 13 minute accessory setae on anterior part. Legs all yellowish brown, tarsi somewhat darker than other legs bearing brown, very slender scales; claws small, slightly thickened before tip; proportion of leg

segments, except for coxae and trochanters, about 91.6:90.9:51.4:21.6:16.6:13.6:12.2 in fore leg, 103:119.4:47.9:22.9:17.8:14.5:11.2 in middle leg, and 105.9:107.9:38.1:30.3:21:16.8:21 in hind leg. Fore leg TR about 2.36, middle leg about 2.15, and hind leg about 1.91 (from 1.61 to 2.07).

Wing rather short and oval, brownish gray, costal and radial hairs dark brown, anal lobe obtuse. Venation: Costa extending far beyond middle of wing (43.6:64.2) and just beyond tip of Rs, Rs very long, about 1.5 times as long as R, and about 2.5 times as long as  $R_1$  (21.8:14.9:8.7), first radial cell slit-like, second cell very narrow and about twice as long as first cell (12.2:6.9), fMCu at level of tip of  $R_1$ ,  $M_{s+4}$  ending under costal end. Haltere yellow or white.

Abdomen pale brown to brown, with short brown setae, tergites square and brown, sternites reduced and obscure; cerci brown; single spermatheca rather large, pale brown or brown, oval, 20.1 by 14.4 units, without chitinized duct.

*Male*: Body about 1.51 (1.34-1.77) mm. Wing about 0.88 (0.81-0.94) mm. by 0.28 (0.27-0.29) mm. Coloration and structure generally similar to those of female with usual sexual differences.

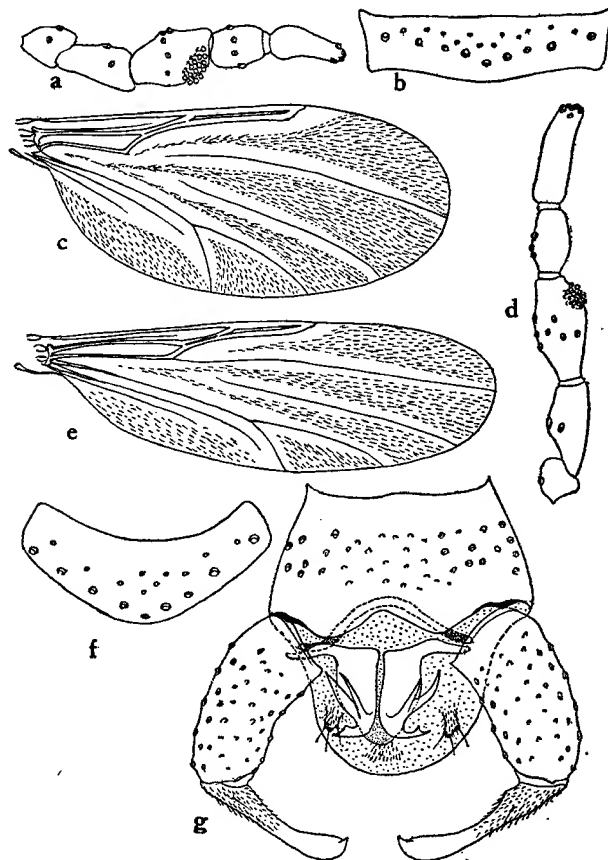


FIGURE 41.—*Forcipomyia (Lasiohelea) carolinensis*. a-c, female: a, maxillary palp; b, scutellum; c, wing. d-g, male: d, maxillary palp; e, wing; f, scutellum; g, hypopygium.

Head with vertex brown, frons and mouthparts pale brown; clypeus with ten to 14 setae; proboscis rather short, about one-half as long as height of head capsule. Maxillary palp rather more slender than in female, with five segments in proportion of 5:11.5:12:7.3:11; segment 3 with scattered sensillae on distal part. Antenna including scape and plumose hairs uniformly brown, but sometimes segments 9 to 11 or 10 to 11 paler; distal eight segments in proportion of 10.5:10:9.8:10.3:23:27:21.5:24; proportion of segments 2 to 10 and 11 to 14 about 104.5:95.5.

Thorax mainly brown, with scutum somewhat yellowish on lateral margins and caudoscuteal area; scutellum yellowish, sometimes lateral sides brown, with six strong bristles and three small setae along caudal margin, and about ten minute accessory setae on anterior half. Legs mainly pale brown, with tarsi more brownish and with narrow pale-brown scales; claws slender; TR about 2.21 in fore leg, 1.92 in middle leg, and 1.76 (1.69-1.84) in hind leg; segments in proportion of 97.3:94.3:50.7:23:17.5:14.5:13.5 in fore leg, 108:113.3:46.7:24.3:19:15.3:13 in middle leg, and 109.7:110.3:56.3:31.3:23.7:18.2:14 in hind leg.

Wing with rather sparse pale brownish-gray hairs and very broad bare areas along veins. Venation: Costa far beyond middle of wing (42.3:67.5), and produced just beyond tip of Rs, second radial cell very narrow, and long, longer than twice first cell (5:12), first cell slit-like, Rs longer than twice  $R_1$  and little shorter than R (16.2:6.2:18.2), fMCu at level of basal one-third of costal margin of second radial cell, tip of  $Cu_1$  little before tip of Rs, costal end at level of distal one-third or at middle of anal margin of cell  $M_4$ . Haltere pale brown.

Abdomen uniformly brown to pale brown. Hypopygium brown; sternite 9 with caudal width about 2.3 times as wide as median length and about 1.5 times as wide as anterior width, its caudal margin with V-shape median incision; tergite 9 roundly produced caudad. Coxite rather slender, about twice as long as wide; style slender, slightly shorter than coxite (26:30), gradually narrowed at middle, and clavate at tip. Aedeagus with pair of strong hook-like sclerites and median round lobe, each lateral sclerite curved laterad at distal quarter, ending widely bifid at tip, and with two unequal strong spines on apical one-third which extend backward, basal angles rather slender and extending laterad, basal arch very low; parameres represented only by pair of basal slender arms, very widely opened caudad in U-shape and without median lobes.

DISTRIBUTION: N. Mariana Is., Caroline Is.

Allotype, male (US), Mutunlik, 16 m., Kusaie I., light trap, Jan. 1953, Gressitt.

N. MARIANA IS. ANATAHAN: Six females, Aug. 1951, R. Bohart.

PALAU. BABELTHUAP: Ulimang, female, Dec. 1947, Dybas; Ngiwal, four females, male, at light, May 1957, Sabrosky; Ngaremlengui, 20 females, two males, at light, June 1957, Sabrosky; Imeliik, female, June 1957, Sabrosky. KOROR: Six females, five males, May 1957, four females, male, June 1957, Sabrosky; islet near Koror, two females, Sept. 1952, Gressitt. MALAKAL: three females, May 1957, Sabrosky.

YAP. YAP: Rumung I., female, two males, June 1957, Sabrosky; Nif, two males, July-Aug. 1950, Goss. GAGIL-TOMIL: Gagil Distr., female, July 1950, Goss.

PONAPE. Agric. Exper. Sta., Colonia, 16 m., seven females, light trap, Jan. 1953, Gressitt.

KUSAIE. Pukusrik, five females, light trap, Feb., Mar., Apr. 1953, Clarke; Mutunlik, ten females, two males, light trap, Jan., Mar. 1953, Clarke and

Gressitt; Mutunlik, three females, Feb.-Mar. 1953, Clarke; Mwot, female, Apr. 1953, Clarke.

The structure of the male hypopygium is highly characteristic and differs noticeably from other known species.

**41. *Forcipomyia (Lasiohelea) stimulans* (de Meijere). (Figure 42.)**

*Ceratopogon stimulans* de Meijere, 1909, Tijdschr. Ent. 52: 197 (Sumatra and Java).

*Forcipomyia stimulans* (de Meijere), Macfie, 1934, Tijdschr. Ent. 77: 207.

Dark-brown; maxillary palp rather stout, segment 3 with very shallow sensory pore on basal half; hind TR about 2.3-2.39, legs and wing without scales, with rather dense macrotrichia and very narrow bare areas along veins, second radial cell very narrow and long, Rs far longer than R; spermatheca single, short oval.

*Female*: Body about 1.34 mm. long. Wing about 0.38 mm. by 1.04 mm.

Head dark brown, including mouthparts, with eyes contiguous above; clypeus with about 19 setae. Maxillary palp rather stout; segment 3 somewhat flask-shape, not distinctly narrowed distally, and with rather large but shallow sensory pore on basal half;

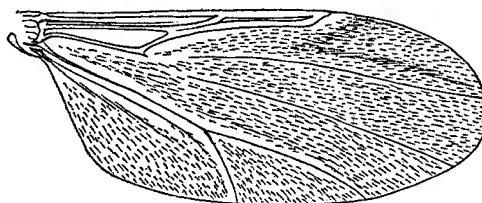


FIGURE 42.—*Forcipomyia (Lasiohelea) stimulans*, female wing.

ultimate segment slightly tapered and blunt at tip; five segments in proportion of 9:11:15:7.5:9. Antenna uniformly dark brown, basal short flagellar segments subspherical, about as long as wide; distal eight segments in proportion of 7:7:7.5:16.5:18:?:?:? (apical three segments missing).

Thorax almost entirely dark brown; scutellum with eight strong bristles and three small setae along caudal margin and about nine minute setae on anterior half. Legs entirely brown, but tarsi somewhat paler, without scales, claws slender, empodia rather slender, TR about 2.7 in fore leg, 2.76 in middle leg, and 2.39 in hind leg; leg segments, except for basal two, in proportion of 95:93:54:20:15:12:13 in fore leg, 110:116:58:21:15:13:13 in middle leg, and 116:110:67:28:?:?:? in hind leg.

Wing with veins brown, dense macrotrichia all over surface, but not long, without scales even on radial or costal veins. Venation: Costa extending far beyond middle of wing (46:34) and slightly produced beyond tip of Rs, Rs much longer than R and three times as long as  $R_1$  (23:16:8), first radial cell slit-like, second radial cell long, fully twice as long as stem and very narrow,  $M_{1+2}$  and bases of its branches atrophied, stem of fMCu about 1.7 times as long as R (27.5:16), fMCu under tip of  $R_1$ , tip of  $Cu_1$  at level of middle of second radial cell, tip of costa beyond middle of anal margin of cell  $M_4$ . Haltere brown.

Abdomen entirely dark brown, without scales; cerci brown; single spermatheca large, brown, short oval, about 26 by 22 units, with very minute chitinized duct.

*Male*: Wing about 1.09 mm. by 0.34 mm. Coloration generally as in female.

Head with eyes bare; clypeus with less than ten setae. Maxillary palp with five segments in proportion of 5:13:19.5:9.5:10, segment 3 rather slender, fusiform, with shallow common depression of group of sensillae at middle. Antenna almost uniformly brown, including plumose hairs; proportion of segments 2 to 10 and 11 to 14 about 113:108; distal eight segments in proportion of 10.5:11:11:10.5:27:30:23:26.5.

Thorax: Scutellum with six strong and three small bristles in line along caudal margin and with about seven minute accessory setae on anterior half. Legs without scales; proportion of segments, except for basal two, about 110:108:62:28:21:16:14 in fore leg, 125:130:63:30:23:16:14 in middle leg, and 128:127:74:32:18:14 in hind leg; TR about 2.21 in fore leg, 2.1 in middle leg and 2.31 in hind leg.

Wing with macrotrichia rather dense, but bare areas along veins distinct, anterior veins pale brown. Venation: Costa ending far beyond middle of wing (49:82),  $R_s$  about twice as long as  $R_1$  and a little shorter than  $R$  (19:9.5:22), first radial cell absent, second cell as long as stem (9:9), stem of  $fMCu$  about 1.6 times as long as  $R$  (37:22),  $fMCu$  under middle of second radial cell, tip of  $Cu_1$  at level of tip of costa. Haltere entirely brown.

Abdomen uniformly brown, hypopygium missing.

DISTRIBUTION: Sumatra, Ceylon (?), central Africa (?), northwest Africa (?), Brazil (?), Caroline Is.

YAP. YAP: Yaptown, male, July 1946, Townes; female, July-Aug. 1950, Goss.

#### 42. *Forcipomyia (Lasiohelea) ancoriformis* Tokunaga, n. sp. (fig. 43).

Rather small, brown, without scales and colored marking of wings. Maxillary palp without sensory pores but with a group of scattered sensillae on segment 3. Male with TR of hind leg about 2.29 and claws slender and bifid only at apices. Male wing with second radial cell narrow and distinctly longer than slit-like first cell, bare areas along veins partly distinct. Male hypopygium without caudal lobes of parameres; aedeagus paired, strongly chitinized on basal and mesal margins, and with hook-like caudal projections strongly curved laterad, divergent from each other and anchor-shape.

*Male*: Body about 1.43 mm. long. Wing about 1.0 mm. by 0.29 mm. General coloration brown, scales of wings, legs, and other parts absent.

Head entirely brown including mouthparts, with eyes contiguous above, clypeus with about 14 setae, proboscis about half as long as length of head capsule (12:25). Maxillary palp slender, segment 3 with several scattered sensillae at middle and without sensory pore, five segments with relative length of 5:13:20:9:10. Antenna with scape dark brown, other segments and plumose hairs brown, segment 11 longer than or subequal to ultimate and only a little shorter than 12; relative combined length of segments 2 to 10 and 11 to 14 about 102:100 and proportional length of distal eight segments about 10:10:10:10:25:27:21:24.

Thorax entirely brown, scutum with very faint, slender and pale stripes on mid-dorsal line and paired foveae. Legs entirely brown; hind leg with TR about 2.29, tibial comb of hind leg with seven bristles; claws slender, moderately curved, and slightly bifid at tips; leg segments, except for basal two, in proportion of 104:101:60:26:19:13:14 in fore, 127:124:62:20:20:16:14 in middle, and 121:120:71:31:22:16:14 in hind leg.

Wing without colored marking, very pale, with veins pale brown, bare areas along veins rather distinct on central part of wing but almost absent on marginal part. Venation: Costa ending far beyond middle of wing (46:76.5) and little beyond level of tip of  $Cu_1$ , relative length of  $R$ ,  $M$ , and stem of  $fMCu$  about 21:19:33,  $R_s$  about twice of  $R_1$  (17:8), first radial cell almost absent, being represented by faint slit-like space, second cell well formed, very narrow and far longer than first (6:8.5),  $fMCu$  under or just beyond tip of  $R_1$ ,  $M_{3+4}$  longer than twice of  $Cu_1$  (22:9.5). Haltere brown.

Abdomen with sclerites brown, membranes very pale. Hypopygium with tergite 9 round on caudal margin, sternite 9 rather long, about three-fourths as long as tergite, with

band of setae on basal one-third, without caudal emargination and caudal membrane quite bare and narrow; coxites cylindrical, about 2.3 times as long as basal width and with erect setae on mesal margin of each coxite; styles almost straight, slightly clavate pre-apically, about 0.7 as long as coxites, and slightly curved on pointed apices, aedeagus separated at middle into paired parts, basal arch rather low and triangular, strongly chitinized on basal and mesal margins, with basal lobes broad, hyaline and apical horn-like processes divergent laterad in anchor-shape; parameres, slender, arch-like, with two arms and median part subequal in length (15:15:15), and without caudal lobes.

*Female*: Unknown.

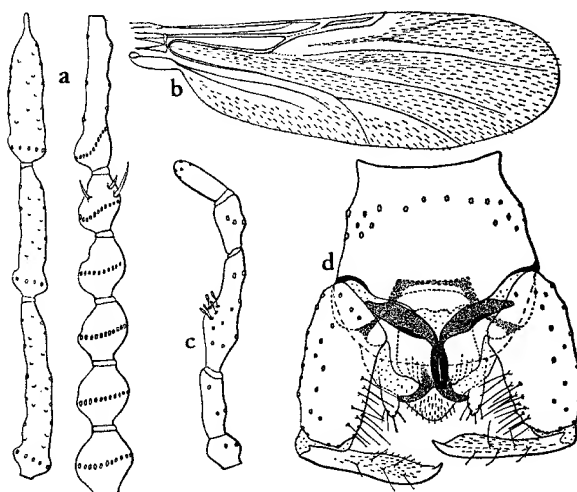


FIGURE 43.—*Forcipomyia (Lasiohelea) ancoriformis*, male: a, distal nine flagellar antennal segments; b, wing; c, maxillary palp; d, hypopygium.

Holotype, male (US 64599), Rumung I., Yap Is., at light, June 17, 1957, Sabrosky.

DISTRIBUTION: Caroline Is. (Yap).

This species is somewhat allied to *F. (L.) stimulans* de Meijere, but distinctly different from the allied species in the following points of the hypopygium: The styles are not distinctly narrowed basally; the aedeagus is broader and provided with slender horn-like apical processes; and the arch of parameres is far wider, lower, and subsquare at middle.

#### 43. *Forcipomyia (Lasiohelea) spinipennis* Tokunaga, n. sp. (fig. 44).

Small, dark brown. Maxillary palp of male with very few scattered sensillae on apical half of segment 3. Male antenna with combined length of distal four segments together subequal to that of preceding basal nine segments together. Scutum almost entirely dark brown; scutellum with six strong bristles arranged in line along caudal margin. Male legs scaly with narrow scales; hind TR about 1.89. Wing of male with bare areas along veins, costa extending well beyond middle of wing and second radial cell very narrow and much longer than first cell. Hypopygium: Sternite 9 short, broad and with caudal

emargination large, semicircular and bare, styles slender and slightly narrowed on middle parts; aedeagus subdivided into two large hook-like structures bearing minute spine-like process at caudal curved part.

*Male:* Body length about 1.39 (1.22-1.6) mm. Wing about 0.96 (0.94-0.99) mm. by 0.3 (0.3-0.31) mm. General coloration dark brown.

Head dark brown, with mouthparts brown, eyes distinctly pubescent and contiguous above, proboscis about half as long as head capsule (11.3:23.3): clypeus with about ten to 15 scattered setae. Maxillary palp slender, with last segment as long as 3, very few sensillae on apical half of segment 3 and five segments in proportion of 4.8:11.4:12.9:7.6:10. Antenna fuscous brown, but plumose hairs and basal short flagellar segments

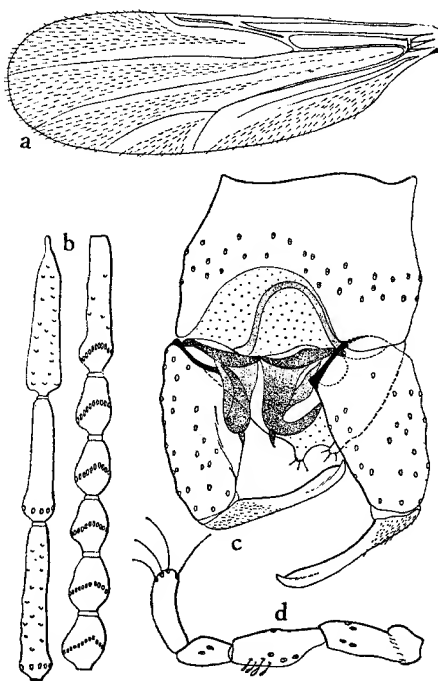


FIGURE 44.—*Forcipomyia (Lasiohelea) spinipenis*, male: a, wing; b, distal nine flagellar antennal segments; c, hypopygium; d, maxillary palp.

somewhat paler; relative combined length of segments 2 to 10 and 11 to 14 equal, or about 97.8:99.5; distal eight segments in proportion of 9.8:9.5:9.9:9.5:23.4:25.4:23.3:28.1.

Thorax entirely dark brown, but sides of scutum somewhat paler, no pale stripes; scutellum with six strong and three small bristles along caudal margin and several (6 to 10) minute hairs on anterior part. Legs thickly covered with two- or three-striped scales; claws simple and rather thick, empodia slender, hind tibial comb with five or six apical bristles; relative length of segments, except for basal two, about 99.5:95:53.3:23.5:19.5:15.5:13 in fore, 108.5:115.3:48.8:25.5:20:16:12.5 in middle, and 112.3:110.7:60:32:24:18.3:13 in hind leg; hind TR about 1.89 (1.87-1.9).

Wing with veins brown, anal angle very obtuse, bare areas along veins distinct, no scales. Venation: Costa extending distinctly beyond middle of wing (46.8:75) and ending at level of midway between tips of  $M_{3+4}$  and Cu, relative length of R, M, and stem of



fMCu about 21:18.8:34.3, Rs longer than twice of  $R_1$  (19:7.8) and extending closely along costa, first radial cell slit-like, second cell very narrow but shorter than twice of first (10.8:6),  $M_{3+4}$  about 2.5 times as long as Cu<sub>1</sub> (20.5:8.5), fMCu beyond tip of  $R_1$  or under middle of first radial cell. Haltere with knob white and stem brownish.

Abdomen fuscous brown. Hypopygium with sternite 9 broad, shorter than wide (29.3:38.3), caudal emargination broad, semicircular, and about half as long as sternite; tergite 9 little longer than wide (39.3:38.3) and round on caudal margin; coxites conical and little longer than twice basal width (33.5:14); styles slender, little shorter than coxites (27.3:33.5), very slightly arcuate and narrowed on middle parts; parameres slender and U-shape; aedeagus subdivided into two large, strongly chitinized, and strongly curved hook-like structures, without basal arch, each hook-like structure bearing a characteristic minute spine-like process at apical end.

*Female*: Unknown.

Holotype, male (US 64600), Ngaremlengui, Babelthuap I., Palau Is., at light, June 3, 1957, Sabrosky. Paratypes, Palau: Four males (BISHOP, US), Koror I., at light, May 2, 1957, Sabrosky; two males, Malakal I., by light trap, May 2, 1957, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau).

This is somewhat allied to *F. (L.) carolinensis* Tokunaga and *ancoriformis* n. sp., but these two allied species are different from the present species in the following points: The male of the first allied species has eyes bare, hind TR at most 1.84, caudal incision of sternite 9 V-shape, and hook-like structures of aedeagus obliquely truncate at tips; the male of the second allied species has eyes also bare, hind TR much larger, 2.29, parameres subsquare on middle part, and hook-like structures of aedeagus with apical curved parts much smaller; neither allied species has the accessory, apical, minute, spine-like processes of aedeagus, distinctly differing from the present species.

### Subgenus *Pterobosca* Macfie

*Pterobosca* Macfie, 1932, Tijdschr. Ent. 75: 266.

Basal flagellar segments of female antenna subspherical or discoidal; distal six or seven flagellar segments elongate. Female maxillary palp distinctly five-segmented. Empodia of female legs very large, broad and with radial structure; claws present or absent; hind TR 3.0 or more; scales of legs absent. Wing of female unmarked, without scale-like hairs, with macrotrichia moderately dense as in *Lasiohelea*; costal vein little or distinctly beyond middle of wing, second radial cell usually open, but sometimes obliterated, as long as, or a little longer than, first radial cell; first radial cell almost closed or slit-like. One or two spermathecae.

Females of known species mainly ectoparasitic on Odonata and rarely on lacewing flies. Males unknown.

### KEY TO SPECIES OF PTEROBOSCA

- |       |  |                    |
|-------|--|--------------------|
| 1.    | Legs with claws.....                         | 2                  |
|       | Legs without claws.....                      | 12                 |
| 2(1). | Distal seven antennal segments elongate..... | 44. <i>feminae</i> |
|       | Distal six antennal segments elongate.....   | 3                  |

3(2).	Second radial cell obliterated.....	4
	Second radial cell distinct.....	6
4(3).	Tarsal segment 4 very small, about half length of 5 (Macfie, 1932; Boeroe Is., Moluccas).....	ariel
	Tarsal segment 4 larger, about two-thirds or three quarters length of 5.....	5
5(4).	Claws slender, not expanded at bases (Macfie, 1936; China).....	latipes
	Claws stouter, expanded at bases.....	45. fidens
6(3).	Basal segments of antenna not much flattened, and subspherical or spherical....	7
	Basal segments of antenna flattened and discoidal.....	8
7(6).	Last antennal segment not gradually tapered, but round on apical part and with round terminal stylet. Tarsal segment 5 as long as 4 and very delicate; empodia small and shorter than claws (Macfie, 1932; New Guinea) .....	odonatiphila
	Last antennal segment gradually tapered and with rather slender terminal stylet. Tarsal segment 5 longer than 4 and very thick; empodia very broad and longer than claws.....	48. chrysopae
8(6).	Claws with tips distinctly cleft.....	9
	Claws with tips not cleft but simple.....	10
9(8).	AR about 2.4. Wing with macrotrichia evenly distributed and no bare areas along veins (Macfie, 1936; England).....	paludis
	AR about 2.6-3.1. Wing with macrotrichia unevenly distributed and bare areas along veins distinct (Coquillett, 1905; N. America, Puerto Rico, Brazil) .....	fuscicornis
10(8).	Claws stout and abruptly turned at middle.....	45. fidens
	Claws slender and evenly arcuate.....	11
11(10).	AR about 2.9. Hind TR about 3.2; tarsal segment 4 about two-thirds length of 5 (Macfie, 1936; Assam.).....	aërobates
	AR about 2.0-2.3. Hind TR about 3.3-3.4; tarsal segment 4 about half length of 5.....	46. esakia
12(1).	Segment 3 of maxillary palp without common sensory pore.....	13
	Segment 3 of maxillary palp with common sensory pore.....	14
13(12).	Single spermatheca; body about 1.4-1.6 mm. long (Oka and Asahina, 1948; Japan).....	tokunagai
	Two spermathecae; body about 2.26 mm. long or longer (de Meijere, 1923; Formosa).....	aeschnosuga
14(12).	Two spermathecae.....	15
	Single spermatheca.....	16
15(14).	Last antennal segment twice as long as penultimate (19:9); segment 3 of maxillary palp with small and more definite sensory pore (Macfie, 1932; Liberia).....	mollipes
	Last antennal segment less than twice penultimate (18:13); segment 3 of maxillary palp with large and shallow sensory pore (Wirth, 1956; Solomon Is.) .....	lairdi
16(14).	Hind TR 3.3; tarsal segment 4 about as long as 5 (Macfie, 1937; Central America) .....	incubans
	Hind TR 3.6-4.1; tarsal segment 4 much smaller than 5.....	47. adhesipes

#### 44. *Forcipomyia* (*Pterobosca*) *feminae* (Tokunaga). (Figure 45.)

*Pterobosca feminae* Tokunaga, 1940, *Tenthredo* 3 (2): 168 (Palau).—Esaki, 1940, *Tenthredo* 3 (2): 185.—Oka and Asahina, 1948, *Mushi* 18 (18): 112.

Black or dark-brown, with antennal segments 2 to 7 very short and discoidal, and seven elongate apical segments instead of six; claws simple, slender, strongly curved; wing with long second radial cell.

*Female*: Body length about 1.6-2.1 mm. Wing about 1.1-1.14 mm. by 0.42-0.44 mm.

Head dark brown to black, with mouthparts brown to dark brown, eyes broadly contiguous above, proboscis little shorter than length of head capsule. Antenna dark brown to black; basal short flagellar segments discoidal, shorter than wide, distal seven segments elongate, somewhat cylindrical; basal segments 2 to 7 very short and disc-like, AR 4.1 to 4.53; segments, except basal one, in proportion of 9.3:6:6:6:6:6:16.5:21:20.8:22.5:22.5:24.3:39.8. Clypeus with only three or four or sometimes seven setae;

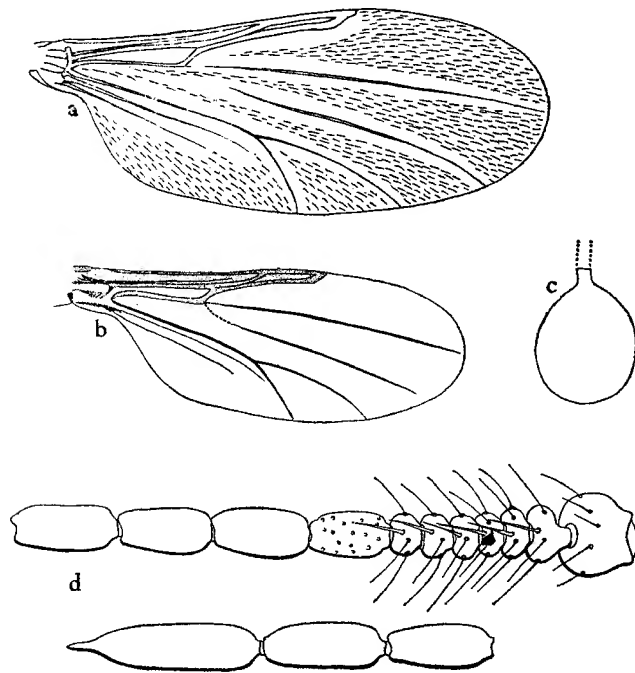


FIGURE 45.—*Forcipomyia (Pterobosca) feminae*, female: a, wing; b, wing (macrotrichia omitted); c, spermatheca; d, antenna.

mandible with about 13 or 14 minute and equal teeth; maxillary palp short, segment 3 short, as long as wide, with sensory pore beyond middle.

Thorax dark brown to black, with scutum shiny and with brown pubescence, membranous areas brown; scutellum with 15 strong bristles and many small median setae. Legs dark brown, short and stout; tarsi brown; fore TR about 3.0-3.32 and hind TR about 2.96-3.17; proportion of leg segments about 120:123:65:20:18:14:18 in fore leg, 136:139:66:23:19:13:17 in middle leg, and 142:142:71:23:22:16:18 in hind leg; hind tibial comb with five bristles; claws as long as penultimate tarsal segments. Empodium very broad, similar in structure to that of *F. mollipes*.

Wing elongate, oval, with veins strong and dark brown, membrane hyaline; macrotrichia thickly spread all over surface and bare areas along veins rather obscure.

Venation: Costa reaching beyond middle of wing and about 0.57-0.64 times as long as wing,  $R_s$  about twice as long as  $R_1$ ,  $R_s$  and  $R_1$  extending closely side by side on part of first radial cell, which is slit-like; second cell long, longer than fused part of  $R_1$  and  $R_s$ ,  $M_{1+2}$ , and bases of  $M_1$  and  $M_2$  atrophied, fMCu slightly before tip of  $R_1$ , tip of  $Cu_1$  under middle of costal margin of second radial cell, costal tip above middle of anal margin of cell  $M_4$ , relative length of  $R$ ,  $R_1$ ,  $R_s$ , and stem of fMCu about 20:11:24:33. Haltere dark brown.

Abdomen with tergal and sternal plates subsquare, brown, not reduced or subdivided, membranous areas brown; cerci dark brown. Single spermatheca brown, oval, about 21.5 by 16 units, with very short chitinized duct, neck part of duct rather distinct.

DISTRIBUTION: Caroline Is.

PALAU. BABELTHUAP: Ulimang, two females, Dec. 1947, Dybas.

CAROLINE ATOLLS. WOLEAI: Utagal, female, July 1946, Townes.

HOST: *Agriocnemis femina* Brauer (Esaki, 1940). (Odonata.)

This ectoparasitic midge is noticeably different from all the known members of *Pterobosca* in the possession of seven elongate antennal segments. It sucks blood from the dorsal center of the thorax of a small damselfly, widely differing from the other known members of *Pterobosca* which take blood from wing veins (Esaki, 1940).

#### 45. *Forcipomyia* (*Pterobosca*) *fidens* (Macfie). (Figure 46.)

*Pterobosca fidens* Macfie, 1936, Roy Ent. Soc. London, Proc. B, 5 (12): 227 (Hainan).—Cowley, 1940, Nat. Hist. Soc. Formosa, Trans. 30 (196): 1.

Dark brown, antenna with distal six segments elongate and more or less cylindrical and basal seven segments flattened and discoidal, AR about 2.44-2.6; legs with claws strong, strongly curved, and basally expanded, tarsal segment 4 about two-thirds as long as 5; wing with second radial cell obscure and line-like, macrotrichia rather sparsely spread all over surface but bare areas along veins very broad and distinct.

*Female*: Body length 1.4-1.79 mm. Wing 0.95-0.99 mm. by 0.4-0.43 mm.

Head dark brown, with eyes bare, broadly contiguous above; mouthparts brown, with proboscis very small. Maxillary palp short, segment 3 about 1.5 times as long as wide with small sensory pore beyond middle, segment 5 tapered, five segments in proportion of 7:10:13:8:11, mandible with about nine to ten small teeth. Antenna with scape dark brown, other segments brown, seven short basal segments flattened, discoidal, about one-half as long as wide, distal six segments somewhat cylindrical, and terminal segment with small apical stylet; AR about 2.44-2.6; nine distal segments in proportion of 5:5:5:13:12.8:13.5:13.5:15.3:22.8.

Thorax entirely dark brown; scutellum with pair of lateral bristles, two pairs of median bristles, and ten or more minute accessory setae. Legs with coxae to tibiae brown, tarsi somewhat paler; claws well developed, stout, strongly curved and expanded at base; empodium large, consisting of about ten radially arranged lobes; TR of fore leg about 2.9-3.12 and that of hind leg about 3.0-3.38; segments of fore leg, except for basal two, in proportion of 100.5:105:50.5:16.5:12:10:15, those of middle leg 119.5:113.5:55:18.5:15.3:11:16, and those of hind leg 117.5:118.5:60.5:19:14.8:11:16.3.

Wing with veins and radial cells brown, macrotrichia rather sparsely over surface, remaining broad bare areas along veins; in cell  $R_s$  line of trichia between  $R_s$  and  $M_1$ , in cell  $M_1$  two lines of trichia between bases of  $M_1$  and  $M_2$ , and these two lines very closely arranged and united into one line just under distal end of  $M$ , in cell  $M_2$  a line of trichia extending between median vein and stem of fMCu and ending at arculus. Venation: Costa ending slightly beyond middle of wing (41:75) and slightly before tip of  $Cu_1$ , two

radial cells indistinct, represented by common brown lines, relative length of R, R<sub>1</sub>, R<sub>s</sub>, and stem of fMCu about 14:10:18.5:31.5, fMCu slightly before tip of R<sub>s</sub>. Haltere dark brown.

Abdomen with tergites not reduced and brown, sternites more or less constricted at middle or with median incision at anterior margin and pale brown; pleural membranes very slightly brown. Cerci brown and round; two spermathecae subequal, oval, brown, and 11.5 by 17 units and 14.5 by 19 units, with very short chitinized duct.

Specimens from Gilbert Islands are somewhat smaller, wing about 0.92 mm. by 0.4 mm.; these differ slightly in following points from the description of material from

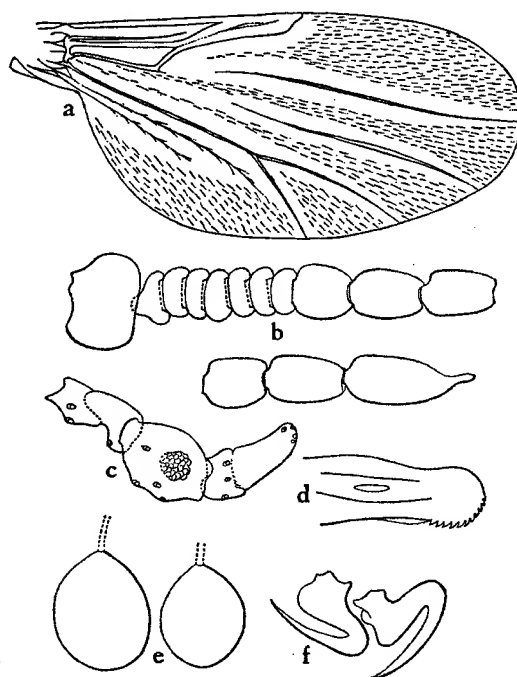


FIGURE 46.—*Forcipomyia* (*Pterobosca*) *fidens*. a, wing, female. b-f, female, Gilbert Is.: b, antenna; c, maxillary palp; d, distal end of mandible; e, spermathecae; f, tarsal claws.

Marshall Islands: Maxillary palp with rather large, but shallow, sensory pore on segment 3 and five segments in proportion of 7:9:12:4.5:10; mandible with ten teeth gradually decreasing in size toward apex; antenna with distal nine segments in relative length of about 4.5:4.5:5:10.5:12.5:11.5:12.5:14:22 and AR varying from 2.42 to 2.95; fore leg with TR about 2.47; hind leg with segments in proportion of 113:110:58:17:14.5:12.5:15 and tibial comb with six or seven apical bristles; abdomen with sternites almost complete, but not well-chitinized; two spermathecae about 19 by 16 units and 16.5 by 14 units.

DISTRIBUTION: Hainan I., Ryukyu Is., Marshall Is., Gilbert Is.

MARSHALL IS. LIKIEP: Likiep I., three females, Aug. 1946, Townes.

GILBERT IS. TARAWA: Bairiki I., two females, Dec. 1957, Krauss.

HOSTS: *Orthetrum pruinatum neglectum* Rambur and *Crocothemis servilia* Drury. (Odonata.)

Macfie and Cowley reported that this parasitic midge was found attached to the bases of the wings of female dragonflies. The host of this midge in the Marshall and Gilbert Islands is unknown.

**46. *Forcipomyia* (*Pterobosca*) *esakia* (Tokunaga), n. name.**

*Pterobosca esakii* Tokunaga, 1940, Philippine Jour. Sci. 71 (2): 210 (Saipan; preoccupied by *F. esakii* Tokunaga: 169).—Esaki, 1940, Philippine Jour. Sci. 71 (2): 227.—Tokunaga, 1940, Tenthredo 3 (2): 168.—Esaki, 1940, Tenthredo 3 (2): 185.—Oka and Asahina, 1948, Mushi 18 (18): 112.

Black, shiny, with basal antennal segments 2 to 8 very flattened and discoidal, maxillary palp with common sensory pore on segment 3; legs with slender claws, wing with macrotrichia rather sparse and bare areas along veins broad, second radial cell distinct; two spermathecae.

*Female*: Body length 1.4 to 2 mm. Wing about 0.95 mm. by 0.37 mm. General coloration black and shiny. Haltere dark brown.

Head with eyes broadly contiguous above. Mouthparts short and stout; maxillary palp rather slender, segment 3 with small common sensory pore on preapical part and sensillae invisible externally, five segments in proportion of 6:12:18:9:14. Antenna dark brown; ultimate segment with a prominent papilliform terminal process; AR about 2.3; distal eight segments in proportion of 5.5:5.5:12.8:13:14.5:15:17.5:27.

Thorax dark brown or black, shiny, with pleural membranes yellow, scutellum without special strong bristles. Legs dark brown and stout; segment 4 of legs very narrow, obliquely truncate apically; segment 5 square, thick, and with slender and strongly curved claws, empodium very large, with 12 or 13 radial lobes and two pairs of plumose hair-like pulvilli. Femora and tibiae thickened; fore and hind TR about 3.75 and 3.3-3.5; proportion of leg segments, except for basal two, about 19:19:9:3:2:1.5:3.1 in fore leg, 22:22:10:3:2.5:1.5:3.2 in middle leg, and 23:22:10:3:2.5:1.5:3 in hind leg.

Wing unadorned, with veins fuscous, membrane hyaline, macrotrichia rather sparsely distributed over surface and bare areas along veins very broad. Venation: Costa ending slightly beyond middle of wing, relative length of costa and wing about 37:70, second radial cell slightly longer than  $R_1+R_s$  (32:30), base of  $M_2$  obscure, fMCu slightly beyond tip of  $R_1$  or under middle of second radial cell, tip of  $Cu_1$  under tip of costa, length of  $R$ ,  $R_1$ ,  $R_s$ , and stem of fMCu in proportion of 13:8:17:29. Haltere brown to dark brown.

Abdomen with tergal and sternal sides black and slightly shiny, lateral membranous areas dark yellow, tergal and sternal plates brown, somewhat square and not reduced; two spermathecae, dark brown, subspherical or short-oval, subequal, without chitinized ducts, about 20 by 14 units and 19 by 14 units; cerci brown, discoidal, not round but somewhat angulate.

DISTRIBUTION: S. Mariana Is., western Caroline Is.

S. MARIANA IS. GUAM: Umatac, female, dragonfly wing, Feb. 1948, Maehler.

PALAU. BABELTHUAP: Ngiwal, female, light trap, May 1957, Sabrosky.

HOSTS: *Tramea limbata* Desjardines, *Pantala flavescens* Fabricius, *Tholmis tillarga* Fabricius, and *Diplacodes bipunctata* Brauer (Saipan). (Odonata.)

**47. *Forcipomyia (Pterobosca) adhesipes* (Macfie).**

*Pterobosca adhesipes* Macfie, 1932, Tijdschr. Ent. **75**: 270 (Java and New Guinea); 1936, Roy. Ent. Soc. London, Proc. B, **5** (2): 227.—Tokunaga, 1940, Philippine Jour. Sci. **71** (2): 209 (Ponape, Kusaie).—Esaki, 1940, Philippine Jour. Sci. **71** (2): 227.—Tokunaga, 1940, Tenthredo **3** (2): 168.—Oka and Asahina, 1948, Mushi **18** (18): 109, 112.

Dark brown, with basal antennal segments 2 to 8 flattened and discoidal, maxillary palp with common sensory pore on segment 3; legs without claws; wing with distinct second radial cells; single spermatheca.

*Female*: Body length 1.6-2.28 mm. Wing 1.2 (0.8-1.3) mm. by 0.48 (0.3-0.5) mm. Head black, with mouthparts brown. Thorax dark brown, with pleural and sternal sclerites brown, pleural membranes yellow. Legs brown, knee joints dark brown, coxae brown. Wing without colored marking. Haltere white. Abdomen with tergal plates yellowish brown, sternal plates dark brown, membranous areas yellow.

Head with eyes broadly contiguous above. Clypeus with four median setae and pair of lateral setae. Proboscis short, but stout, about one-third of vertical length of head capsule. Maxillary palp five-segmented (8:11:13:9:10), short and stout; segment 3 with large shallow sensory pore furnished with short sensillae. Antenna dark brown, segments 2 to 8 flattened and disc-like, segments 9 to 14 elongate and somewhat cylindrical, last segment with terminal nipple-like process; AR about 2.53; distal eight segments in proportion of 7.5:7.5:19:21:22:21:23:34.

Thorax dark brown; scutum black and with brown pubescence, caudoscuteal area brown and with dark-brown median cloud. Legs stout, with hind TR about 3.78 (3.4-4.1); tarsal segment 4 very short, obliquely truncate, usually about one-half length of 5; claws absent; empodium very large and broad, semicircular, with pair of fleshy pad-like lobes (pulvilli?) at base. Proportion of segments 123:128:74:21:16:10:18 in fore leg, 147:142:79:22:18:12:20 in middle leg, and 156:155:84:25:21:13:20 in hind leg.

Wing with macrotrichia rather thick but bare areas along veins distinct, veins fuscous, and membrane hyaline. Venation: Costa extending beyond middle of wing, costa to wing in proportion of 56:94, first radial cell obliterated, second radial cell large and distinct, longer than  $R_1+R_s$  (42:38),  $M_{1+2}$  forking just beyond r-m, but forking not clearly visible, bases of two branches being deficient, fMCu under base of second radial cell, tip of  $Cu_1$  just before tip of  $R_s$ , relative length of R,  $R_1$ ,  $R_s$ , and stem of fMCu 23:11:23:36.

Abdomen with tergal plates transverse and subsquare, sternal plates of segments 3 to 8 small, oval or cordiform. Cerci dark brown, round and disc-like. Single spermatheca, short oval, 17 by 12 units, brown, with many hyaline punctures, chitinized duct short and sometimes almost absent.

DISTRIBUTION: Java Sea, New Guinea, eastern Caroline Islands.

PONAPE. Agric. Exper. Sta., Colonia, female, light trap, Jan. 1953, Gressitt.

HOSTS: *Agrionoptera insignis allogenae* Tillyard, *Hemicordulia silvarum* Ris, *Orthetrum sabina* Drury and *Lestes praemorsus* Selys (New Guinea), *Orthetrum chrysis* Selys and *Raphismia bispina* Hagen (Java Sea), *Tramea limbata* Desjardines, *Agrionoptera insignis similis* Selys, *Tholymus tillarga* Fabricius, *Diplacodes bipunctata* Brauer, *Hemicordulia haluco* Asahina, and *H. erico* Asahina (Esaki, 1940). (Odonata.)

**48. *Forcipomyia (Pterobosca) chrysopae* Tokunaga, n. sp. (fig. 47).**

Medium-sized, brown. Mouthparts very short, maxillary palp stout, segment 3 oval and with rather large sensory pore beyond middle; antenna with apical six segments

elongate-oval, basal short flagellar segments slightly discoidal or spherical, AR about 1.78. Legs with claws rather slender, slightly arcuate and simple, empodia very large, with rather long basal petioles and each with about 12 radial ray-like structures, penultimate tarsal segments obcordate, about two-thirds as long as ultimate, ultimate strongly thickened; hind TR about 3.15. Wings with first radial cell slit-like and second cell rather large, bare areas along veins distinct. Two spermathecae, unequal, one oval and one sub-spherical and each with a short neck of duct.

*Female*: Body length about 1.69 (1.51-1.78) mm. Wing about 1.07 (1.04-1.11) mm. by 0.44 (0.43-0.44) mm. Coloration generally brown and scales absent.

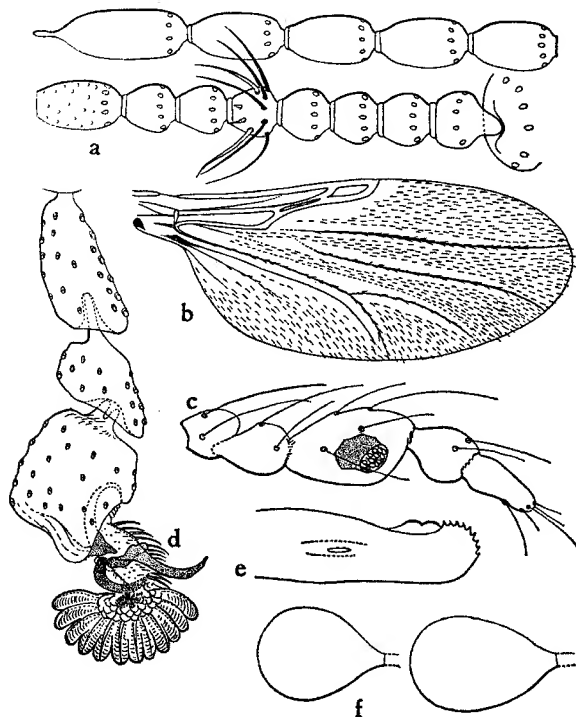


FIGURE 47.—*Forcipomyia* (*Pterobosca*) *chrysopae*, female: a, antenna; b, wing; c, maxillary palp; d, distal three tarsal segments of hind leg with claws and empodium; e, distal end of mandible; f, spermathecae.

Head mainly brown or dark brown, with mouthparts pale brown, eyes very large and broadly contiguous above, proboscis very short, about a quarter as long as head capsule (7:28.7), clypeus with usually seven median setae and sometimes more (at most 11) setae. Maxillary palp short, stout, segment 3 oval and with deep sensory pore, ultimate segment longer than penultimate and conical, five segments with proportional length of 6.3:8:13.8:7.8:10.7. Mandible round at tip, with nine equal teeth and two large blunt teeth on hyaline preapical edge. Antenna entirely brown, with basal flagellar segments slightly discoidal or subspherical, ultimate six segments elongate-oval, last segment rather gradually tapered on apical half; AR about 1.78, from 1.58 to 2.05; 13 segments, except for basal one, about 10.7:7:7:7.2:7.5:7.5:7.5:14.7:15:15:14.8:16.7:28.8.



Thorax entirely dark brown, but in paler specimens (teneral?) scutum with faintly paler areas on foveae and caudoscuteal area; scutellum with about 15 strong and 12 small setae. Legs with coxae and trochanters brown, tarsi slightly paler, but last tarsal segments not paler, femora mainly brown, but apical parts gradually paler, fore tibia brown basally and paler apically and middle and hind tibiae entirely pale brown; tarsal segment 4 obcordate and about two-thirds as long as 5, segment 5 strongly thickened and as high as length of penultimate segment, claws slender, as long as tarsal segment 4 and simple, empodia semicircular, with rather long petioles and with ten to 12 radial ray-like structures; hind leg with TR about 3.15, from 3.0 to 3.39, and six apical bristles of tibial comb. Relative length of leg segments, except for basal two, about 113.3:122:51:17.7:13.7:12.3:17.2 in fore, 129.8:123:54.7:19.3:16:12.7:16.7 in middle, and 137.3:130.3:59.7:19.3:16.3:14.3:18 in hind leg.

Wing very pale brown including veins and with bare areas along veins distinct. Venation: Costa ending beyond midway of wing (45.5:82.2) and above tip of  $Cu_1$ , relative length of R, M, and stem of fMCu about 18:15.3:34.7, Rs about 1.7 times as long as  $R_1$  (11.3:19), first radial cell very narrow and slit-like, second cell well formed, and slightly shorter than first (7.3:9.3),  $M_{1+2}$  a little longer than r-m, fMCu just beyond tip of  $R_1$ ,  $M_{3+4}$  about 1.8 times as long as  $Cu_1$  (25.3:14.3). Haltere brown or pale brown.

Abdomen with tergites brown, transverse and complete, sternite slightly paler, sternites 2 to 6 more or less separated into paired hemisternites, membranes very pale brown; subgenital plate with basal obcordate plate and rather broad and widely divergent lateral arms; two spermathecae, brown, unequal, one large and short-oval (1.3+19.8 by 15.7 units) and one small and subspherical (1+18.2 by 14.8 units) and each with very short neck of duct; cerci brown.

Holotype, female (US 64601), Koror I., Palau Is., from wing of a *Chrysopa* sp., July 17, 1946, Townes. Paratypes, Palau Is.: Two females (US, BISHOP), Ngwal, Babelthuap I., light trap, May 19-20, 1957, Sabrosky; six females, Ngaremlengui, Babelthuap I., light trap, June 6-8, 1957, Sabrosky; two females, Melekeiok, Babelthuap I., light trap, May 22, 1957, Sabrosky; female, Koror I., with holotype from the other wing of same host and females, sweeping, Mar. 1954, Beardsley; two females, Peleliu I., light trap, May 28, 1957, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau).

HOSTS: *Chrysopa astur* Banks (Neuroptera: Chrysopidae).

This is the first species of the subgenus *Pterobosca* known from hosts other than Odonata. According to Townes' note of collection, two females, including holotype, were found on dorsal sides of both hind wings of one host near the base, piercing the wing veins of the host. Sabrosky's specimens are all collected by light trap and many of them are thought to be carried into the trap with host-insects and separated from the wings of hosts in the trap.

This new species is closely allied to *F. (P.) odonatiphila* Macfie, but the two species are quite different in the following points: In the allied species, the sensory pore of the maxillary palp is shallow, the last antennal segment is subcylindrical, not distinctly tapered, and with a round terminal stylet, the wing has the anal angle large and distinct, the second radial cell is much longer than the first cell; tarsal segment 4 is as long as 5, the latter is very delicate;

the empodium is small and shorter than claws; the spermathecae are subequal and oval; while in the new species, the sensory pore of the maxillary palp is deep, the last antennal segment is subconical, gradually tapered, and with a slender terminal stylet, the wing has the anal angle very obtuse and indistinct, the second radial cell is only a little longer than the first cell, tarsal segment 4 is distinctly shorter than 5 and 5 is very thick; the empodium is very broad and longer than the claws; the spermathecae are unequal, one subspherical and one oval.

### Genus *Dasyhelea* Kieffer

*Dasyhelea* Kieffer (1911), *Prokempia* Kieffer (1913), *Pseudoculicoides* Malloch (1915), *Tetrahelea* Kieffer (1925), *Cryptoscena* Enderlein and *Dicryptoscena* Enderlein (1936).

Body rather small to minute, short, stout, and moderately hairy. Eyes with very fine pubescence. Frons with tuberculous erection above antennal bases. Antenna of female with distal five segments not markedly differing from basal flagellar segments; that of male with distal four segments elongate and segments 11 to 13 with two rings of verticils; terminal antennal segments with or without terminal stylets. Maxillary palp with first basal segments more or less fused with palpifer and usually four distinctive segments; segment 3 without common sensory pores but scattered sensillae. Mesoscutum without humeral pits and usually without long bristles. Legs slender and unarmed; tarsal segment 1 usually at least twice as long as 2; claws small and equal; empodium vestigial. Wing rather broad, with very fine microtrichia and macrotrichia over all or part of surface; costa reaching about middle of wing, first radial cell absent or obliterated, second radial cell small, usually subsquare, and its inner space very small and often slit-like or obliterated, intercalary fork inconspicuous, medial fork sessile or with very short petiole and usually obscure, cross vein r-m oblique, and anal vein straight; anal lobe obtuse; alula bare; squama usually with small tuft of hairs. In female, abdomen short and broad; spermathecae usually single. In male, abdomen rather more slender but not much longer; tergite 9 usually large, tapered, and with pair of anal points; sternite 9 transverse and more or less produced caudad at median part of caudal margin; coxite short and stout; style stout to slender, simple or with basal branch; aedeagus broad and with paired caudal lobes; parameres often asymmetrical, with paired basal arms and single median lobe.

The identification of the males of the genus may be comparatively easy by close study of the hypopygia, but that of the females is particularly difficult. In this paper, the females of some closely related species were rather satisfactorily separated by the difference in the structure of subgenital plates, in addition to the usual systematic characters. In spite of our effort for identification, however, a considerable number of females remain undetermined.

### KEY TO MICRONESIAN SPECIES OF MALE DASYHELEA

- |       |   |                         |
|-------|---|-------------------------|
| 1.    | Wing with slit-like first radial cell.....  | 58. <i>parvistylata</i> |
|       | Wing without first radial cell, R <sub>1</sub> and R <sub>s</sub> being completely fused.....   | 2                       |
| 2(1). | Hypopygium with parameres symmetrical, including basal lateral arms and caudal median lobe..... | 3                       |
|       | Hypopygium with parameres asymmetrical in structure.....  | 12                      |

- 3(2). Parameres without caudal median lobe..... 4  
 Parameres with caudal median lobe..... 6
- 4(3). Scutum entirely brown or dark brown. Parameres very slender....**78. truncata**  
 Scutum with distinct paler spots on brown ground color. Parameres  
 broadened on lateral parts..... 5
- 5(4). Fore and middle femora and fore tibia each with distinct brown or dark  
 band at middle. Sternite 9 with pair of caudal projections finely ser-  
 rulate apically.....**49. esakii**  
 Fore and middle legs without distinct median bands, but femora broadly  
 and obscurely brownish on middle parts. Sternite 9 without caudal pro-  
 jections .....**50. nigristigmata**
- 6(3). Sternite 9 forming sagittiform caudal projection.....**76. sagittifera**  
 Sternite 9 without sagittiform caudal projection..... 7
- 7(6). Hypopygium with styles far shorter than coxites and wedge-like or beak-  
 like ..... 8  
 Hypopygium with styles almost as long as coxites and slender or claw-  
 like ..... 11
- 8(7). Sternite 9 with one or two caudal processes strongly developed..... 9  
 Sternite 9 without well-developed caudal processes..... 10
- 9(8). Sternite 9 with two caudal processes sharply pointed.....**66. furcillifera**  
 Sternite 9 with one caudal process round at apex.....**63. pallivittae**
- 10(8). Aedeagus with collar-like structure and without axe-like appendages  
 .....**57. raripilosa**  
 Aedeagus without collar-like structure and with pair of axe-like ap-  
 pendages.....**85. nigripygma**
- 11(7). Antenna without terminal stylet. Scutum entirely yellowish....**51. flavicaudalis**  
 Antenna with terminal stylet distinct. Scutum entirely brownish or dark  
 .....**75. dybasi**
- 12(2). Hypopygium with additional processes arising from bases of coxites..... 13  
 Hypopygium without additional processes of coxites arising from their  
 bases ..... 14
- 13(12). Sternite 9 with spatula-like caudal projection; additional processes of  
 coxites slender and strongly chitinized; median caudal lobe of para-  
 meres very small and straight.....**77. quarternihamata**  
 Sternite 9 without caudal projection; additional processes of coxites  
 small and weakly chitinized; median caudal lobe of parameres very long  
 and strongly curved on apical part.....**53. gressitti**
- 14(12). Median caudal lobe of parameres bifurcate..... 15  
 Median caudal lobe of parameres simple and not bifurcate..... 20
- 15(14). Two branches of median caudal lobe of parameres almost equal..... 16  
 Two branches of median caudal lobe of parameres distinctly unequal..... 17
- 16(15). Two branches of median lobe of parameres distinctly curved, forming  
 rather broad space between two branches; styles of hypopygium slender  
 and undulate. Scutellum usually with three median large bristles  
 .....**67. palauensis**  
 Two branches of median lobe of parameres almost straight, forming very  
 narrow cleft between them; styles moderately thickened, tapered, and  
 slightly curved. Scutellum usually with five median large bristles  
 .....**60. subscutellata**
- 17(15). Scutum almost entirely brown or dark..... 18  
 Scutum largely yellowish, very pale brown, or with brownish-yellow or  
 orange-yellow subconfluent vittae..... 19

- 18(17). Smaller branch of median lobe of parameres sharply pointed and located on sub-basal or middle part of lobe.....82. *peliliouensis*  
 Smaller branch of median lobe of parameres obliquely truncate and located on preapical part of lobe.....62. *townesi*
- 19(17). Styles of hypopygium not distinctly tapered, but almost uniform in width; aedeagus subsquare or subpentagonal, and with a median hyaline mushroom-like process; smaller branch of median lobe of parameres curved and hyaline at base.....52. *flavescens*  
 Styles of hypopygium distinctly tapered; aedeagus triangular and without median mushroom-like process; smaller branch of median lobe of parameres not curved, uniformly chitinated, and blunt.....79. *palloris*
- 20(14). Median caudal lobe of parameres represented by elongation of basal lateral arm, not by an independent sclerite.....21  
 Median caudal lobe of parameres represented by independent sclerite, connected with mesal end of one lateral basal arm.....23
- 21(20). Coxites of hypopygium each with apical strong process beside style.....61. *dupliforceps*  
 Coxites of hypopygium each with apical style only.....22
- 22(21). Scutum with four separated brown or dark vittae on yellow ground color. Sternite 9 round on caudal margin.....65. *sabroskyi*  
 Scutum almost entirely brown or dark brown. Sternite 9 with caudal projection spatula-like and extending between lateral sclerites of aedeagus.....80. *insularis*
- 23(20). Antenna with a distinct terminal stylet.....24  
 Antenna without distinct terminal stylet.....27
- 24(23). Median caudal lobe of parameres very long, longer than either lateral basal arm and tape-like.....71. *carolinensis*  
 Median caudal lobe of parameres subequal to or shorter than the longer lateral basal arm.....25
- 25(24). Aedeagus with one pair of caudal lobes.....74. *subperfida*  
 Aedeagus with two pairs of caudal lobes.....26
- 26(25). Terminal stylet of antenna slender and sharply pointed. Styles of hypopygium slightly arcuate and curved at tips.....73. *perfida*  
 Terminal stylet of antenna stout and not sharply pointed but rather blunt at tip. Styles of hypopygium almost straight and not curved at tips.....86. *striipennis*
- 27(23). Abdominal segments 1 to 3 yellowish, differing from caudal brownish segments.....56. *flavibasalis*  
 Abdominal segments almost uniformly brownish or dark.....28
- 28(27). Aedeagus with accessory median dark process.....83. *insulicola*  
 Aedeagus without accessory median process.....29
- 29(27). Median lobe of parameres truncate at tip.....81. *nigroris*  
 Median lobe of parameres sharply pointed.....84. *fumala*

## KEY TO MICRONESIAN SPECIES OF FEMALE DASYHELEA

1. Wing with stigmal spot black, large and square.....49. *esakii*  
 Wing without distinct black stigmal spot.....2
- 2(1). Wing with first radial cell slit-like.....3  
 Wing without first radial cell,  $R_1$  and  $R_s$  completely fused at this area.....5

- 3(2). Single spermatheca.....59. sp. No. 3  
Three spermathecae, including small or vestigial one..... 4
- 4(3). Antenna without distinct terminal stylet; basal flagellar segments oval and with neck parts. Smallest spermatheca tubular. Subgenital plate without basal ring.....58. *parvistylata*  
Antenna with distinct terminal stylet; basal flagellar segments subspherical to short-oval and without neck parts. Smallest spermatheca spherical. Subgenital plate with basal ring.....92. *multifascia*
- 5(2). Scutum almost entirely yellow, very pale brown or with pale-brownish vittae ..... 6  
Scutum almost entirely brown, dark brown or with yellowish spots on brownish ground color, or with distinct brown or dark-brown vittae on yellowish ground color..... 13
- 6(5). Scutum entirely yellow..... 7  
Scutum very pale brownish or with pale-brownish vittae..... 10
- 7(6). Last antennal segment distinctly longer than penultimate. Spermatheca brown and small..... 8  
Last antennal segment only a little longer than penultimate. Spermatheca yellow and large..... 9
- 8(7). Hind TR larger than 2.7. Subgenital plate almost atrophied.....52. *flavescens*  
Hind TR smaller than 2.7. Subgenital plate present and without basal ring.....53. *gressitti*
- 9(7). Scutellum with three median large bristles. Spermatheca oval, about 17.9 units by 12.8 units, and with stout chitinized part of duct.....51. *flavicaudalis*  
Scutellum with four median large bristles. Spermatheca subspherical, about 26 units by 30 units, and with minute chitinized part of duct.....*flavicaudalis*, variation No. 1
- 10(6). Scutum with three yellowish pale-brown vittae on yellow ground color.....63. *pallivittae*  
Scutum without vittae..... 11
- 11(10). Last antennal segment with tip pointed and distinctly narrowed. Subgenital plate without basal ring.....55. sp. No. 2  
Last antennal segment with tip round and not distinctly narrowed. Subgenital plate with basal ring..... 12
- 12(11). AR larger than 0.9. Hind TR larger than 2.7. Scutellum with three median large bristles. Sternites reduced into membranes. Spermatheca round (17 by 16 units).....54. sp. No. 1  
AR smaller than 0.9. Hind TR smaller than 2.5. Scutellum with four median large bristles. Sternites separated into hemisternites. Spermatheca oval (23 by 14.5 units).....89. sp. No. 10
- 13(5). Scutum with distinct brown or dark vittae..... 14  
Scutum without vittae, but in a few cases with paler or yellowish spots on shoulder, lateral, or caudoscuteal areas..... 25
- 14(13). Lateral vittae slender and not broadened on anterior parts or not accompanied by additional short vittae on shoulder parts..... 15  
Lateral vittae broadened on anterior shoulder parts or accompanied by additional short vittae on shoulder parts..... 17
- 15(14). Spermatheca with chitinized part of duct long; subgenital plate without basal ring.....64. *vittula*  
Spermatheca with chitinized part of duct very short or without this part; subgenital plate with basal ring..... 16

- 16(15). Scutellum with six median large bristles. Subgenital plate with basal ring subsquare; spermatheca with dark dots on surface.....60. *subscutellata*  
 Scutellum with three median large bristles. Subgenital plate with basal ring cordiform; spermatheca without dark dots on surface.....65. *sabroskyi*
- 17(14). Anal wing cell with macrotrichia arranged in line on membrane separated from anal margin..... 18  
 Anal wing cell with many macrotrichia on membrane of caudal half along anal margin..... 19
- 18(17). Wing veins related to radial cells strongly thickened. Abdominal sternites separated into paired hemisternites; spermatheca oval.....57. *raripilosa*  
 Wing veins related to radial cells not strongly thickened, but normal. Abdominal sternites complete and subsquare; spermatheca round.....68. *sp. No. 4*
- 19(17). Subgenital plate with basal ring..... 20  
 Subgenital plate without basal ring..... 22
- 20(19). Abdominal sternites 1 to 5 separated into paired hemisternites; spermatheca round.....69. *sp. No. 5*  
 Abdominal sternites complete and subsquare; spermatheca oval..... 21
- 21(20). Subgenital plate with basal ring cordiform, space between two caudal arms V-shape and with minute dark sclerite between bases of caudal arms.....70. *sp. No. 6*  
 Subgenital plate with basal ring subtrapezoid, space between two caudal arms U-shape and without chitinized sclerite between bases of caudal arms.....62. *townesi*
- 22(19). Shoulder parts of scutum each with small, but distinct, isolated, brown spot on yellow ground color. Subgenital plate with small funnel-like basal accessory structure.....61. *dupliforceps*  
 Shoulder parts of scutum uniformly yellowish or paler. Subgenital plate without funnel-like basal accessory structure..... 23
- 23(22). Abdominal sternites completely reduced into membranes and without sclerites.....72. *sp. No. 7*  
 Abdominal sternites 1 to 7 not completely reduced, at least represented by paired hemisternites..... 24
- 24(19). Abdominal sternites complete and subsquare; subgenital plate without accessory sclerite between bases of two caudal arms; spermatheca oval.....67. *palauensis*  
 Abdominal sternites 1 to 5 subdivided into paired hemisternites; subgenital plate with small U-shape sclerite between bases of two caudal arms; spermatheca round.....66. *furcillifera*
- 25(13). Wing cell  $M_4$  and anal cell without macrotrichia. Basal two abdominal segments yellow, caudal segments brown.....56. *flavibasalis*  
 Wing cell  $M_4$  and anal cell with macrotrichia. Basal abdominal segments brown, similar to caudal segments..... 26
- 26(25). Ultimate antennal segment with distinct, slender, and well-developed terminal stylet..... 27  
 Ultimate antennal segment without well-developed terminal stylet, apical end round, tapered gradually, or simply papilliform..... 30
- 27(26). AR about 0.75. Scutellum with four median bristles and without small accessory setae. Legs with all femora and tibiae uniformly very pale.....86. *striipennis*  
 AR larger than 0.8. Scutellum with many median setae, more than four, and usually several small accessory setae. Legs with femora and tibiae brown or at least hind femora with brownish preapical band or brown cloud on pale ground color..... 28

- 28(27). Femora and tibiae of all legs almost entirely brown. Abdominal tergites with indistinct pale punctures at bases of setae.....71. *carolinensis*  
Femora and tibiae of all legs very pale and at least hind femur with broad preapical brown band or cloud. Abdominal tergites with very distinct pale punctures at bases of setae..... 29
- 29(28). TR of fore leg at least 3.0 and usually larger than 3.0. Median bristles of scutellum well separated from lateral bristles.....73. *perfida*  
TR of fore leg smaller than 3.0. Median and lateral bristles of scutellum arranged in continuous row along caudal margin.....74. *subperfida*
- 30(26). Scutum with pair of large, but ill-defined, yellow clouds on caudoscuteal area. Abdominal sternites almost entirely reduced to membranes.....76. *sagittifera*  
Scutum without pale or yellowish large clouds or spots on caudoscuteal area. Abdominal sternites not completely reduced, at least represented by paired hemisternites..... 31
- 31(30). Basal ring of subgenital plate absent.....75. *dybasi*  
Basal ring of subgenital plate present..... 32
- 32(31). Antenna with plumose, long hairs, somewhat resembling those of male. Abdominal sternites 3 and 4 irregularly atrophied partly.....87. *sp. No. 8*  
Antenna with normal short hairs as in typical female. Abdominal sternites 3 and 4 regularly subdivided into hemisternites or not subdivided but complete ..... 33
- 33(32). Abdominal sternites 3 to 4 or 3 to 5 subdivided into paired hemisternites.... 34  
Abdominal sternites 3 to 7 not subdivided into paired hemisternites, but subsquare ..... 38
- 34(33). Subgenital plate with pair of minute accessory sclerites between bases of caudal lateral arms.....80. *insularis*  
Subgenital plate without accessory sclerites between bases of caudal lateral arms..... 35
- 35(34). Spermatheca oval; caudal lateral arms of subgenital plate with bases very broad, occupying caudal half of basal ring.....77. *quarternihamata*  
Spermatheca subspherical; caudal lateral arms of subgenital plate with bases narrow, not occupying caudal half of basal ring.....36
- 36(35). Scutellum yellowish. Haltere pale brownish yellow.....88. *sp. No. 9*  
Scutellum brownish or dark. Haltere brown..... 37
- 37(36). TR of hind leg 2.42-2.45. Last antennal segment round at tip...85. *nigripygma*  
TR of hind leg about 2.21, from 2.13 to 2.28. Last antennal segment tapered and rather pointed.....81. *nigroris*
- 38(33). Scutellum dark brown. Haltere dark brown.....84. *fumala*  
Scutellum yellow or much paler than scutum. Haltere yellow or very pale..... 39
- 39(38). Wing rather slender, resembling that of male; macrotrichia sparse, absent between M and stem of fMCu.....91. *sp. No. 12*  
Wing broad, broader than in male; macrotrichia rather dense, present between M and stem of fMCu..... 40
- 40(39). Distal five antennal segments slender and cylindrical; last antennal segment tapered and somewhat pointed at tip. Scutellum usually without small accessory setae. Subgenital plate with basal ring distinctly extended cephalad, forming petiole-like process.....82. *peliliouensis*  
Distal five antennal segments rather short and suboval; last antennal segment rather round at tip. Scutellum with few small accessory setae. Subgenital plate with basal ring not distinctly extended cephalad.....90. *sp. No. 11*

49. *Dasyhelea esakii* Tokunaga (fig. 48, a).

*Dasyhelea esakii* Tokunaga, 1940 Philippine Jour. Sci. 71 (2): 212 (Kusaie); 1940, Tenthredo 3 (2): 172.

Rather large, mottled; scutum dark brown with yellow and white spots; scutellum yellow, with small dark-brown spot and three large median bristles; legs with knee joints and apical ends of segments black, fore femur, tibia, and middle femur with distinct brown band on white ground color; wing macrotrichia rather sparse, and with single black square spots on second radial cells. Abdomen with many yellowish-white and dark-brown dorsal bands. In male, wing cells  $M_1$  and  $M_2$  with only several macrotrichia on apical parts and cells  $M_4$  and anal cell without macrotrichia; tergite 9 bluntly projected at laterocaudal parts and without distinct anal points; sternite 9 with pair of caudo-median processes.

In dry specimens, thoracic dorsal side entirely highly pruinose; scutum with pair of large white spots on anterior part and large dark-brown T-shape spot on caudoscuteal area, pair of short dark-brown stripes along lateral sides of foveae and other parts of scutum gray; scutellum mainly yellowish gray and with small dark-brown median spot.

*Male*: Body about 1.86 mm. long. Wings about 1.07 by 0.36 mm.

Head dark-brown, with eyes broadly contiguous above, frontal tubercle somewhat oval, mouthparts yellowish brown; clypeus with seven or eight setae. Maxillary palp pale yellow and with five segments in proportion of 5:8.5:17:7.5:11.3. Antenna with scape dark brown; flagellar segments and plumose hairs yellowish brown, but distal four segments more brownish, last segment elongate and without terminal stylet; proportion of distal eight segments about 9.5:9.8:10:10.5:22:20.8:19.8:27.5; proportion of segments 2 to 10 and 11 to 14 about 96:88.

Thorax: Scutum dark brown, with pair of large subtriangular yellow spots on humeral areas, pair of oblong yellow spots on caudoscuteal area, small white spot at middle of lateral margin and oblong obscure yellow spot at caudal part of lateral margin; scutellum yellow, with small dark-brown median spot, two large lateral and three large median bristles, without small accessory setae; postscutellum and main pleural and sternal sclerites dark brown. Legs mainly white, with coxae dark brown, knee joints, and distal ends of tibiae and those of basal four tarsal segments dark brown or black, last tarsal segments pale brown, fore femur, tibia, and middle femur with distinct brown median band, middle tibia often with similar band; leg segments, except for basal two, in proportion of 103:98:57.7:20.3:14.3:11:11.7 in fore leg, 135.3:114.8:77.3:24.3:15.7:11:12.2 in middle leg, and 120.1:108.3:76:31:21.3:11.7:12.7 in hind leg.

Wing glassy hyaline, with stigma dark or dark brown, large and square, macrotrichia very sparse, cell  $R_s$  with trichia on distal marginal area, cell  $M_1$  with several trichia on apical area, cell  $M_2$  with few trichia on apical margin, and cell  $M_4$  and anal cell without trichia. Venation: Costa ending little beyond middle of wing (44:82),  $R_s$  short, little shorter than half of  $R$  (11.5:24.5) and about 1.4 times as long as  $R_1$  (11.5:8.3), first radial cell absent, second cell square, large, and about half as long as stem (14:31), stem of fMCu about 1.5 times as long as  $R$  (37.3:24.5), fMCu under costal end. Haltere yellowish white.

Abdomen with many dark-brown and yellowish-white bands on dorsal side, anterior six segments yellowish white, but tergites 3 to 6 with dark-brown anterior bands interrupted at middle, sternite 6 with pale-brown paired hemisternites, segments 7 and 8 broadly dark brown and each with brown intersegmental band, sternite 9 and tergite 9 dark brown basally and brown on caudal parts. Hypopygium brown, with style dark brown; sternite 9 with pair of rather long caudal processes at middle extended caudad beneath aedeagus, not beyond its caudal margin, and finely serrulate at tips; tergite 9 little longer than basal width, tapered, slightly concave at caudal margin, bluntly and broadly projected at laterocaudal parts, and without distinct anal points. Coxite conical and about 1.5 times as long as basal width (26.5:17.5); style short, and about 0.62 times as long as coxite (16.3:26.5), with basal part swollen, apical half rather slender, almost



straight, and slightly incurved at pointed tip. Aedeagus rather small, with Y-shape thickening, hyaline membranous expansion on either lateral side, and without paired caudal lobes; parameres without median lobe, basal arms large, rather broad, and arranged in a transverse position between dorsal bases of coxites.

*Female*: Body about 1.86 mm. Wings about 0.95 (0.91-1.05) mm. by 0.41 mm. Coloration closely similar to that of male, although often somewhat paler.

Head: Maxillary palp with five segments in proportion of 5.5:10.5:16.5:6.5:11. Antenna with basal segments, including scape, yellowish brown, and gradually more brownish on distal segments; last segment without terminal stylet and much longer than penultimate; proportion of distal eight segments about 10.3:9.8:9.8:11:11.8:11.8:12:21.2; AR about 0.79 (0.75-0.82, 67.3:85.8).

Thorax with two lateral and three median bristles on scutellum and without small accessory setae. Legs with segments, except for coxae and trochanters, in proportion of 97:93.5:55:18.3:14.5:11.5:12 in fore leg, 129:120:71.5:23:15.5:12:12 in middle leg, and 114.5:105:72.5:30.5:21.5:12.5:12.5 in hind leg.

Wing with black stigma far larger than in male, macrotrichia rather sparse, arranged along marginal area of distal half, cell  $M_4$  with few trichia along margin and anal cell with two to four trichia at distal corner. Venation: Costa ending little beyond middle of wing (41.3:75.6),  $R_s$  about 0.63 times as long as  $R$  and about 1.59 times as long as  $R_1$  (13:20.7:8.2), second radial cell much longer than half of stem (16.6:29.3), stem of fMCu long and about 1.5 times of  $R$  (31.3:20.7), fMCu under tip of  $R_1$  or just beyond it.

Abdomen with cerci brown; spermatheca short oval, small, about 14.6 by 10.3 units with distinct chitinized duct pale brown at apical part.

DISTRIBUTION: Caroline Is., Marshall Is., Gilbert Is.

PALAU. NGAIANGL: Six females, Dec. 1952, Gressitt. BABELTHUAP: Ulimang, female, Dec. 1947, Dybas; Ngiwal, two females, May 1957, Sabrosky; Ngaremlengui, female, June 1957, Sabrosky; Melekeiok, six females, May 1957, Sabrosky. KOROR: Southwest part, 25 m., female, Dec. 1952, Gressitt. NGERKABESANG: Male, at sea shore, Nov. 1947, Dybas. ANGAUR: Two females, two males, Feb. 1948, Dybas.

YAP. YAP: Rumung I., 25 females, two males, June 1957, Sabrosky; Colonia (Kolonina), female, July-Aug. 1950, Goss. GAGIL-TOMIL: Tomil Distr., three females, July-Aug. 1950, Goss; Gagil Distr., female, July 1950, Goss; Gagil Distr., three females, June 1957, Sabrosky.

CAROLINE ATOLLS. KAPINGAMARANGI: Touhou I., 46 females, at light, July-Aug. 1954, Niering.

TRUK. TON: Mt. Unibot, female, Jan. 1953, Gressitt.

PONAPE. South of Nanpohnmal, female, Jan. 1953, Clarke.

KUSAIE. Pukusrik, two females, Feb., Apr. 1953, Clarke; Mutunlik, 25 m., 19 females, Jan.-Feb. 1953, Clarke; Mutunlik, 14 females, Jan. 1953, Gressitt; Mutunlik, nine females, male, Apr. 1953, Clarke; Mutunlik, female, Feb. 1953, 236 females, six males, Apr. 1953, Clarke; Mwot, two females, Apr. 1953, Clarke; Malem, male, Apr. 1953, Clarke.

MARSHALL IS. ENIWETOK: Jobtan I., 129 females, 12 males, Aug.-Sept. 1956, Tuthill; 27 females, Jan.-Feb. 1957, Tuthill. AILINGLAPALAP: Bikajela I., 11 females, male, Aug. 1954, Townes. JALUIT: Majurirok I., female, April 1958, Gressitt.

GILBERT IS. TARAWA: Bairiki I., 15 females, four males, Nov. 1957, Krauss; Naanikai I., male, Nov. 1957, Krauss; Teaoraereke I., female, Nov. 1957, Krauss.

This species is highly specific in its characteristic coloration and closely allied to a Marquesan species, *D. pacifica* Macfie (1933) as already discussed by Tokunaga (1940) and a Micronesian species, *D. nigristigmata*, which is compared with *D. esakii* in this text.

**50. *Dasyhelea nigristigmata* Tokunaga and Murachi, n. sp. (fig. 48, b).**

Large, highly pruinose, closely similar in coloration to *D. esakii*; antenna without terminal stylet; scutum brown or dark brown and with yellowish pale-brown spots in mounted specimen; scutellum yellowish brown and with two lateral and three median bristles; legs mainly white, but fore and middle femora with pale-brown broad bands at middle parts, hind femur and all tibiae without middle bands; wing without macrotrichia on membrane, veins around second radial cell dark; abdomen with many very pale-brown bands.

*Male*: Body about 1.7 mm. long. Wings 1.04 mm. by 0.34 mm.

Head brown, with frontal tubercle oval, maxillary palp and labella very pale brown; clypeus with about seven median setae and without lateral setae. Maxillary palp with five segments in proportion of 6:10:16:8:12; last segment slightly constricted beyond middle. Antenna with scape dark brown, flagellum and plumose hairs yellowish brown, but distal four segments more brownish; terminal stylet absent; distal eight segments in proportion of 9:8.8:9:8.8:15.5:14.5:15.5:22.8; segments 2 to 10 and 11 to 14 in proportion of 94.5:70.

Thorax (in mounted specimen) with scutum brown or dark brown and with several yellowish pale-brown spots on humeral parts, caudoscuteal area, and lateral margins, humeral spots large and with small brown cloud at center, caudoscuteal spots paired and oblong, long lateral spots along dark-brown margins of posterior half of scutum; scutellum yellowish brown, with two lateral and three median bristles and without accessory setae; other parts of thoracic sclerites all dark brown. Legs with coxae brown, knee joints dark brown, other joints brown, other parts of legs mainly white, but fore and middle femora with broad pale-brown bands at middle, fore tibia almost uniformly pale brown, hind tibia pale brown on apical one-fourth; leg segments, except for basal two, in proportion of 108:103:61:20:18:12:13 in fore leg, 138:123:75:23.5:16:12:12 in middle leg, and 116:111:73:30:24:15:16 in hind leg.

Wing glassy hyaline, without macrotrichia on membrane, veins around second radial cell dark and stigma-like. Venation: Costa slightly beyond middle of wing (42:80), relative length of R, R<sub>1</sub>, R<sub>s</sub>, and stem of fMCu about 21:10:13:36, first radial cell absent, second cell square, shorter than half of its stem (15:35), fMCu at level of tip of costa. Haltere with stem yellowish pale brown and knob white.

Abdomen with dorsal side banded, tergite 1 with brown band on anterior margin and pair of transverse brown spots along caudal margin and other parts pale brown, tergite 2 with pair of large subtriangular brown spots and two lunate pale bands confluent at middle, tergites 3 to 6 brown, with lunate pale-brown band along caudal margin, other caudal tergites brown. Sternites 1 to 5 entirely pale yellow, 6 also yellowish, but with pair of pale-brown clouds; other caudal segments all brown including hypopygium. Hypopygium with sternite 9 transverse, about 2.5 times as broad as long, its posterior margin gradually membranized; tergite 9 rounded, slightly tapered caudad, with pair of rather large, blunt subtriangular anal points, coxite rather short and stout, about 1.3 times as long as wide (29:22); style rather short, about 0.8 of coxite (23:29), stout, distinctly curved at base, then tapered, and almost straight, with apex pointed and slightly curved inward at extreme tip. Aedeagus bell-shape, basal arch almost absent, basal edge strongly thickened and

slightly projected laterad forming blunt processes, median caudal projection rather large, slightly curved ventrad; parameres slightly asymmetrical, without median lobe, basal arms transverse, rather broad, with mesal ends small, sharply pointed, and contiguous at these pointed mesal ends.

*Female*: Unknown.

Holotype, male (US 64031), Bikajela Islet, Ailinglapalap Atoll, Marshall Is., Aug. 25, 1946, Townes.

DISTRIBUTION: Marshall Is. (Ailinglapalap).

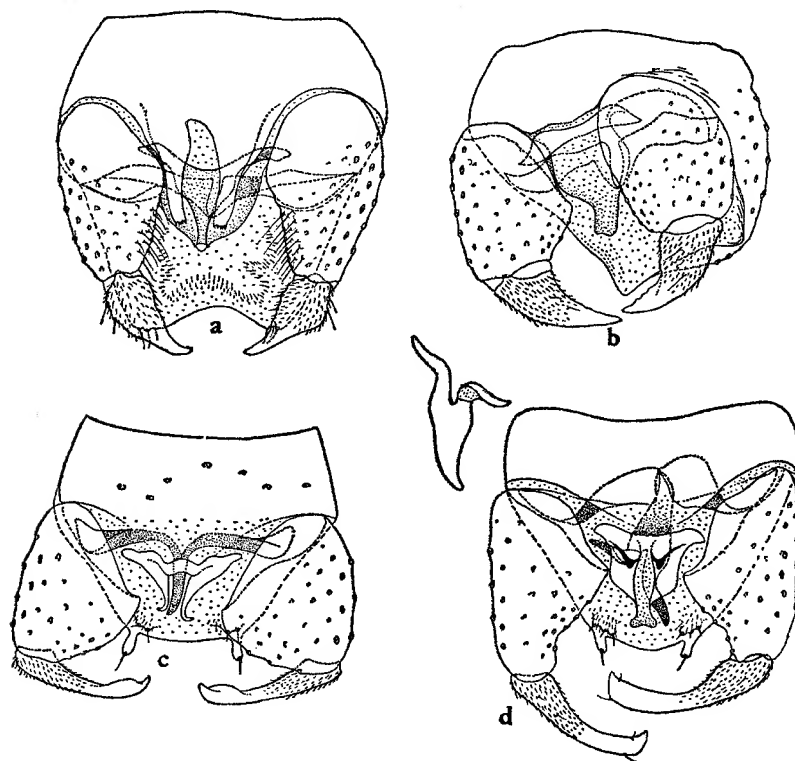


FIGURE 48.—Hypopygium, male: a, *Dasyhelea esakii*; b, *D. nigristigmata*; c, *D. flavicaudalis*; d, *D. flavescens* with median lobe of parameres.

This species is extremely similar to *D. esakii* in coloration, except for the slight difference in leg color. However, the male hypopygium is somewhat different, since sternite 9 is not extended into paired serrulate caudal lobes but is uniformly membranous on caudal part before the aedeagus. This species is named in relation to the very distinct dark stigmata of the glassy hyaline wings.

**51. *Dasyhelea flavicaudalis* Tokunaga and Murachi, n. sp. (fig. 48, c).**

Rather small, yellow; last antennal segment without terminal stylet; thorax entirely yellow, scutellum with three median large bristles; legs almost uniformly yellow; wing with macrotrichia rather sparse. In male, style or hypopygium slender, aedeagus large, and with paired lobes large and curved at tip, parameres symmetrical, with median lobe rod-like and as large as aedeagal lobes, sternite 9 with several setae transversely arranged on middle part. In female, penultimate four segments 10 to 13 not differing from basal segments in shape and size; spermatheca yellow, oval or pyriform, and with thick chitinized duct.

*Male:* Body about 1.38 mm. Wings about 0.79 mm. by 0.23 mm.

Head yellowish brown; clypeus with about nine setae. Maxillary palp pale yellow, with five segments in proportion of ? : 5 : 10 : 5 : 9. Antenna with scape dark brown on dorsal half and yellowish brown on ventral half, flagellar segments and plumose hairs all brown; proportion of segments 2 to 10 and 11 to 14 about 101.5 : 88; distal eight segments in proportion of 9.5 : 9 : 9 : 9 : 17 : 22 : 21.5 : 27.

Thorax entirely yellow; scutellum with two large lateral and three large median bristles and without small accessory setae. Legs all yellow, but last tarsal segments somewhat brownish; leg segments from femora to tarsi in proportion of 82 : 85 : 35 : 18 : 15 : 13 : 13 in fore leg, 94 : 94 : 44 : 19 : 16 : 12 : 12 in middle leg, and 89 : 89 : 60 : 24 : 19 : 13 : 13 in hind leg.

Wing with macrotrichia on membrane very sparse, costal and radial veins pale brown. Venation: Costa short and ending at middle of wing (30 : 61), Rs short, about 0.41 as long as R and about 1.75 times as long as  $R_1$  (7 : 17 : 4), first radial cell absent, second cell little shorter than stem (3 : 4), stem of fMCu about 1.6 times as long as R (27 : 17), fMCu little beyond costal end. Haltere entirely yellow.

Abdomen with tergites brown, but those of segments 7 and 8 brown only on median parts and yellow on other parts, pleural and sternal membranes yellow. Hypopygium yellow, but style, aedeagus, and median lobe of parameres brown; sternite 9 transverse, without caudal projection, about one-third as long as wide, with about ten bristles transversely arranged on middle part; tergite 9 rather short, semicircular, and with pair of distinct cylindrical anal points. Coxite conical, little longer than basal width (25 : 23 : 5); style rather slender, slightly arcuate, tapered, slightly swollen preapically and pointed at tip. Aedeagus large, somewhat triangular in outline, with basal bar short and curved, convex cephalad, paired lateral lobes large, widely separate at base, strongly convergent caudad, tapered and curved laterad at pointed apices; parameres symmetrical, with median lobe rod-like, as large as aedeagal lobes, extended caudad between aedeagal lobes, ending in blunt tip, basal arms divergent cephalad on basal part, then extended laterad, increasing in thickness, and ending at base of coxite in strongly thickened edges.

*Female:* Body about 1.24 mm. long. Wing about 0.66 mm. by 0.26 mm. Coloration generally similar to that of male.

Head with mouthparts yellow; clypeus with ten or more (10-15) setae. Maxillary palp with five segments in proportion of ? : 5.4 : 10 : 6.1 : 7.4. Antenna with scape brown on dorsal and yellow on ventral side, flagellar segments all brown; AR about 0.83 (58.1 : 69.8, from 0.72 to 0.94); distal eight segments in proportion of 9.1 : 8 : 7 : 8.9 : 10 : 10.2 : 10.3 : 10.4 : 16.7; segments 10 to 11 only slightly longer than basal and not different in shape, ultimate segment without terminal stylet.

Thorax similar to male, but rarely scutellum with small accessory median setae. Legs entirely yellow; segments from femora to tarsi in proportion of about 65.8 : 66.6 : 32 : 16.2 : 13.5 : 11.1 : 11.2 in fore leg, 81 : 81.8 : 37.6 : 16.9 : 14.1 : 11.4 : 11.2 in middle leg, and 78.8 : 73.8 : 49.5 : 20.4 : 16.6 : 12.2 : 11.6 in hind leg.

Wing with macrotrichia rather sparse and anterior veins pale brown. Venation: Costa ending little beyond middle of wing (26.7 : 50.7), Rs about 0.74 as long as R and about 1.7 times as long as  $R_1$  (9 : 12.5 : 5.3), first radial cell absent, second cell subtri-

angular and little shorter than stem (3.8:5.3), stem of fMCu about 1.74 times as long as R (21.7:12.5), fMCu more or less beyond tip of R<sub>1</sub>. Haltere entirely yellow.

Abdomen extensively yellow, but first six tergites more or less brownish; cerci yellow; spermatheca yellow, round or pyriform, 17.9 by 12.8 units, with stout chitinated duct.

Holotype, male (US 64032), Pingelap I., Pingelap Atoll, Caroline Atolls, Jan. 26, 1953, Gressitt. Allotype, female (US), same data as for holotype. Paratypes, female, two males (BISHOP), Mt. Temwetemwensekir, Ponape I., 100-180 m., Jan. 11, 19, 1953, Gressitt; three females, same data as for holotype.

DISTRIBUTION: Eastern Caroline Is. (Ponape, Pingelap).

This species is very closely allied to *D. flavescens* in appearance, but details of the hypopygial structure of the male are distinctly different, and the spermatheca is also different in shape and size. Except for the great difference in the coloration, the male hypopygium of the present species more closely resembles that of *D. nigroris* with slight differences in the shape of the basal bar of the aedeagus and the median lobe and basal arms of the parameres. This species is named in relation to the extremely yellowish caudal appendages of the male which are almost always dark-brown or brownish, even in other paler species.

***Dasyhelea flavicaudalis* Tokunaga and Murachi, var. No. 1.**

Coloration very similar to females of the type, but spermatheca very large, distinctly differing from that of the type.

*Female*: Body length about 1.11 mm. Wing about 0.61 mm. by 0.26 mm.

Head almost entirely yellow, with frontal tubercle somewhat rhombic; clypeus with about 12 setae. Maxillary palp with five segments in proportion of 7:5:13:6:7. Antenna all brown; flagellar segments more or less oval, segments 10 to 13 not different from preceding ones, ultimate segment oblong, round at tip, and without terminal stylet; AR about 0.76 (47:62); distal eight segments in proportion of 8:8:8:9:9:9:9:12.

Thorax entirely yellow, scutum with faint-brown vittae, scutellum with two large lateral and four large median bristles and accessory small seta. Legs entirely yellow; proportion of leg segments from femora to tarsi about 64.5:66:30:13.5:12:8:9 in fore leg, 77.5:82:36:15:13:9:9 in middle leg, and 75:74:41.5:18.5:15:10:9 in hind leg.

Wing with macrotrichia rather dense, cell M<sub>4</sub> with about 35 trichia, anal cell with many trichia, costal and radial veins brown. Venation: Costa ending just beyond middle of wing (24.5:47), Rs about two-thirds as long as R and about 1.6 times as long as R<sub>1</sub> (8:12:5), second radial cell about 0.65 as long as stem (13:20) and inner space slit-like, stem of fMCu about 1.6 times as long as R, fMCu under tip of R<sub>1</sub>, Cu<sub>1</sub> ending just before costal end. Haltere entirely yellow.

Abdomen yellow and with brownish tergal clouds on anterior segments; spermatheca very large, round, yellow, about 30 by 26 units, and with a short chitinated duct.

*Male*: Unknown.

DISTRIBUTION: Eastern Caroline Is. (Kusaie).

KUSAIE. Mutunlik, female, 22 m., Feb. 1, 1953, Clarke.

This form is very slightly different from the type species in the structure of the spermatheca.

**52. *Dasyhelea flavescens* Tokunaga and Murachi, n. sp. (fig. 48, d).**

Medium-size, yellow and brown; antenna without terminal stylet; thorax extensively yellow, scutum mainly yellow and with brownish-yellow vittae; scutellum with three or four large median bristles and without small accessory setae. In male, hypopygium with styles rather broad and truncate at tips, aedeagus large, somewhat square, with median caudal projection somewhat obcordate and without independent paired lobes, median lobe of parameres with recurved branch which is hyaline on basal part and thickly chitinized on apical part. In female, antennal segments 6 to 9 with short neck part and those of 10 to 13 with long neck part and somewhat flask-shape, last antennal segment very long, abdominal tergites mainly brown, but penultimate two segments somewhat yellowish, spermatheca almost round, brown, with yellowish pale-brown, very short, chitinized duct.

*Male:* Body about 1.42 mm. long. Wing about 0.93 mm. by 0.28 mm.

Head yellowish brown; clypeus with seven to nine setae. Maxillary palp with five segments in proportion of 3.5:6.3:14.5:7.7:7. Antenna with scape brown, basal segments 2 to 10 pale brown, distal four segments brown, plumose hairs brown, without terminal stylet; proportion of segments 2 to 10 and 11 to 14 about 100.5:92.3; distal eight segments in proportion of 10.5:10.5:10.5:10.7:22.5:23.3:22:27.3.

Thorax extensively yellowish; scutum with brownish-yellow or orange-yellow vittae, sometimes broadly brownish caudoscuteal area and with two oblong yellow spots or sometimes entirely yellow; scutellum entirely yellow, postscutellum, pleural and sternal sclerites somewhat yellowish pale brown and sometimes postscutellum yellow on anterior half; scutellum with two large lateral and three or four large median bristles (rarely, three large median bristles and one small accessory median seta). Legs almost entirely yellow and with brown setae; proportion of leg segments from femora to tarsi about 90:87:47.3:19:17.3:13:13 in fore leg, 120.3:101.3:61:21.7:18:12.3:12 in middle leg, and 105.7:103:63.7:23.3:19.2:14:13.3 in hind leg.

Wing with rather sparse macrotrichia, bare areas along veins broad, costal and radial veins pale brown. Venation: Costa ending just beyond middle of wing (36:69), Rs short, about half as long as R and about 1.5 times as long as  $R_1$  (10.3:20.3:6.8), first radial cell absent, second cell about half as long as stem, stem of fMCu about 1.61 times as long as R (32.7:20.3), fMCu just, or slightly, beyond costal tip. Haltere pale brownish yellow.

Abdomen brown, with brown setae and without pale punctures at bases of tergal setae. Hypopygium: Sternite 9 with caudomedian projection round and not beyond basal arch of aedeagus; tergite 9 as long as, or a little longer than, basal width, round on caudal margin, and with short but distinct anal points. Coxite rather slender, conical, about 1.65 times as long as basal width; style a little shorter than coxite, rather broad uniformly, slightly arcuate, obliquely truncate at tip. Aedeagus rather broad, basally pointed laterad, very shallowly concave at middle of basal margin, somewhat square on central part, with obcordate median caudal projection and pair of subtriangular thickenings (paired aedeagal lobes) on dorsal side of square central part; parameres with median lobe rather large, almost as long as style, broad at middle, bifurcate beyond middle, one apical branch entirely chitinized, extended caudad, and ending at level of tip of aedeagus in round tip, other lateral branches recurved laterad, basally hyaline and membranous, and with claw-like sclerite on apical part; basal arms rather broad and short, dextral arm somewhat smaller than sinistral.

*Female:* Body length about 1.52 (1.43-1.73) mm. Wing about 0.87 mm. by 0.34 mm. Coloration generally similar to that of male.

Head yellowish brown including mouthparts; clypeus with eight (6-9) setae. Maxillary palp with five segments in proportion of 4.5:6.8:14.4:8.3:7.6. Antenna with scape yellowish brown, other segments brown; AR 0.97 (87.2:89.8, varying from 0.96 to 1.0); proportion of distal eight segments about 10.9:11.5:12:15.8:16.5:16.3:16.2:23.2; segments 2 to 5 round to short oval, segments 6 to 9 bulbous and with short neck parts, segments 10 to 13 with long neck about one-third length of the segments, last segment elongate, not sharply pointed at tip, and without terminal stylet.

Thorax almost entirely yellow, but sometimes scutum with pale brownish-yellow vittae and caudoscuteal area pale yellow; scutellum with two large lateral and three, very rarely four, large median bristles and without small accessory setae. Legs with segments all yellow and from femora to tarsi in proportion of 87:86.3:58.3:20:16.3:13.3:12.8 in fore leg, 113.8:101:56.5:20.6:16.8:11.8:11.6 in middle leg, and 107:98.5:64.5:23:19.3:13.5:12.7 in hind leg.

Wing with macrotrichia spread over surface rather sparsely, bare areas along veins rather broad, costal and radial veins pale brown. Venation: Costa ending beyond middle of wing (37.7:67.9), Rs about 0.8 as long as R and about 1.6 times as long as  $R_1$  (14:17.5:8.8), first radial cell absent, second cell subsquare, small and about half as long as stem (4.9:8.6), fMCu under or just beyond tip of  $R_1$ , tip of  $Cu_1$  under second radial cell. Haltere yellow.

Abdomen with tergites mainly brown, sternites yellow, lateral membranes pale brown or yellowish pale brown, penultimate two segments yellow on lateral parts of dorsal side; cerci brown; spermatheca single, brown, round or very short oval, 17.2 by 13.3 units, with a very short, yellowish pale-brown chitinated duct.

Holotype, male (US 64033), Majetto Islet, Jaluit Atoll, Marshall Islands, Aug. 24, 1946, Townes. Allotype, female (US), same data as for holotype. Paratypes: Mariana Is., male, Rota I., June 23, 1946, Townes; Marshall Is., male, Majuro Atoll, July 28, 1946, Townes; two males, female, Majetto I., Jaluit Atoll, Aug. 24, 1946, Townes; five males, female, Bikajela I., Ailinglapalap Atoll, Aug. 25, 1946, Townes; female, near Airok I., Ailinglapalap Atoll, Aug. 26, 1946, Townes.

Other specimens:

Palau. Three females, Koror, May 2, 17, 1957, Sabrosky.

Yap. Male, Weloy, Dugor, June 1957, Sabrosky.

Ponape. Female, Nanipil, Net Distr., Feb. 25, 1948, Dybas.

Marshall Is. Female, three males, Eniwetok A., Aug. 2-26, 1956, Tuthill; 14 females, 11 males, Arno A., June 21, 1950, La Rivers; ten females, two males, Bikajela I., Ailinglapalap A., Aug. 25, 26, 1946, Townes; 27 females, 18 males, Majetto I., Jaluit A., Aug. 24, 1946, Townes; two females, Majuro A., Aug. 28, 1946, Townes.

Gilbert Is. Female, Marenanuka I., Tarawa A., Dec. 1957, Krauss.

DISTRIBUTION: Mariana Is. (Rota), Caroline Is. (Palau, Ponape, Yap), Marshall Is., Gilbert Is.

This species is highly specific in the coloration of the thorax, structure of the female antennae, shape of the style, aedeagus and median lobes of the parameres of the male hypopygium. A Japanese species, *D. curtivitta* (Tokunaga, 1940), somewhat resembles the present species in appearance, but the AR is far smaller, about 0.87, the intermediate flagellar segments are all subcylindrical, differing from the flask-like segments and the scutal vittae, and the postscutellum and thoracic sternite are much darker than in the present species.

**53. *Dasyhelea gressitti* Tokunaga, n. sp. (fig. 49).**

Small, yellow and brown, with thorax mainly yellowish and abdomen uniformly pale brown; scutellum with four median bristles and few small accessory setae. Male hypo-

pygium with additional processes at bases of coxites and median caudal lobe of parameres very long, slender and curved at tip. Female subgenital plate without basal ring, lateral arms broad and with circular genital opening between bases of lateral arms.

*Male:* Body length about 1.39 mm. Wing about 0.79 mm. by 0.26 mm.

Head entirely fuscous brown, with eyes very narrowly separated above, proboscis pale brown and very short, being about a quarter of height of head capsule (5.5:20); clypeus with about eight setae, frontal tubercle slender. Maxillary palp pale brown, small, with few spoon-like sensory hairs on ventral side of segment 3 and four segments in proportion of 6:8.5:6.5:6.5. Antenna with scape brown, other segments pale brown, basal short flagellar segments with surface striation on segments 6 to 10, apical four

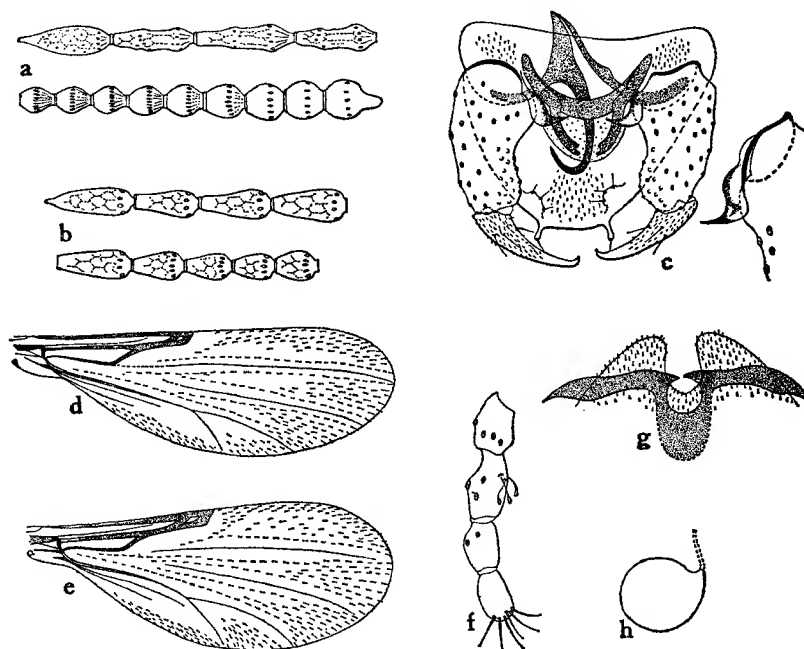


FIGURE 49.—*Dasyhelea gressitti*: a, flagellar antennal segments, male; b, apical nine antennal segments, female; c, hypopygium and basal lobe of coxite, male; d, wing, male; e, wing, female; f, maxillary palp, male; g, subgenital plate; h, spermatheca.

segments with basal striation and reticular sculpture; penultimate four segments with double node-like swellings, ultimate rather sharply pointed apically. Relative combined length of segments 2 to 10 and 11 to 14 about 77:78.5, distal eight segments in proportion of 7.5:7.5:7.5:8:17.5:21.3:17:20.

Thorax with scutum entirely yellow, scutellum and postscutellum slightly fuscous, pleural and sternal sides pale brownish yellow; scutellum with two lateral and four median bristles and very few small setae on middle part. Legs with coxae and trochanters pale brownish yellow and other segments slightly fuscous, all knee joints dark; TR of hind leg about 2.41; hind tibial comb with seven apical bristles. Relative length of leg segments, except for basal two, about 75:77:44:17:15:12:11 in fore, 95:89:43:17:15:11:11 in middle, and 93:87:53:22:17:14:11 in hind leg.



Wing without anal lobe, with macrotrichia sparse, stigmal area slightly fuscous, veins very pale. Venation: Costa ending at middle of wing length (29.5:60.5) and above fMCu, relative length of R, M, stem of fMCu, and Rs about 14:11:26:9, Rs about 1.9 times of  $R_1$  (37:20) and about 3.5 times as long as r-m (37:11), second radial cell about two-thirds of its stem vein (13:19),  $M_{3+4}$  about twice of  $Cu_1$  (17.5:8.5), inner angle of fMCu narrow, about 35 degrees. Haltere entirely fuscous.

Abdomen uniformly pale brown, with sternites complete. Hypopygium pale brownish fuscous, sternite 9 only spinulose on both lateral sides, tergite 9 subtriangular, but its caudal margin round and with normal anal points; coxites rather slender, about twice as long as basal width (23:11), highly setigerous on mesal margins and with peculiar basal processes arising from mesal angles of bases, strongly curved, sharply pointed and weakly chitinized; styles far shorter than coxites (16:23), tapered and claw-like; aedeagus large, with basal arch semicircular, lateral sclerites arcuate, convergent caudad, slender and with apices slightly excavate; parameres slender, with median lobe very long, fully as long as longer basal arm (29:28), fused with shorter arm at base, extending far beyond aedeagus, and strongly curved ventrad on apical part.

*Female*: Body length about 1.4 (1.3-1.6) mm. Wing about 0.8 (0.79-0.82) mm. by 0.3 (0.29-0.31) mm. General structure closely as in male with usual sexual differences and general coloration more yellowish.

Head with about ten clypeal setae, four segments of maxillary palp in proportion of 6.3:9.7:5:5.7. Antenna with poorly developed reticular sculpture on surface, short basal flagellar segments short-oval, last segment with rather stout apical projection; AR about 0.99 (0.94-1.07), proportional length of distal eight segments 9.3:9.8:11.2:14.8:15.2:15.2:13.7:18.8.

Thorax almost entirely yellow, but scutellum somewhat fuscous. Scutellum usually with four median bristles and two or three minute setae but in one specimen with five median bristles. Legs almost entirely slightly fuscous pale brown except brown knee joints. Hind TR about 2.49 (2.33-2.65), tibial comb of hind leg with seven apical bristles. Relative length of leg segments, except basal two, about 78.7:79.7:47:18:15:11.5:9.8 in fore, 98.7:104.3:48.3:18:15.7:11:8.5 in middle, and 99:90:60.7:24.3:19.3:12:9 in hind leg.

Wing without anal lobe, broadest at level of tips of costa and  $Cu_1$ , with veins fuscous, macrotrichia rather sparse, stigmal area fuscous. Venation: Costa ending at middle of wing length (30.8:61.3) and above or just beyond fMCu, relative length of R, M, stem of fMCu and Rs about 14.5:11.2:23.2:10.8, Rs about 1.5 times of  $R_1$  and 2.1 times of r-m (40:27.5:13.5), second radial cell about half as long as its stem vein (12.7:24.7),  $M_{3+4}$  about twice as long as  $Cu_1$  (19:8.6), inner angle of fMCu very narrow and about 35 degrees. Haltere fuscous.

Abdomen entirely fuscous brown, including terminal segment and cerci; sternites complete, subsquare and strongly setigerous. One spermatheca, brown subspherical (1.5+15.3 units by 13 units) and with minute curved neck part; subgenital plate without basal ring, but with a semicircular plate, lateral arms rather broad, slightly undulate and genital opening circular between bases of lateral arms.

Holotype, male (US 64602), Koror I., Palau Is., May 2, 1957, Sabrosky. Allotype, female (US), with holotype. Paratypes, Palau: Female with types; female (BISHOP), Ngaiangl A., Dec. 15, 1952, Gressitt; female, Ngaremlengui, Babelthuap I., June 3, 1957, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau).

This species is closely allied to *D. flavescens* Tokunaga and Murachi in the yellow coloration. However, the male is distinct in the structures of the aedeagus and parameres. The female is different from the allied species in the following points: The flagellar segments of antenna are not provided with well-developed neck parts; the last antennal segment is tapered and more pointed;

the scutellum is not clearly yellow and bears small accessory setae; the wing is not provided with anal lobe and the costa does not extend distinctly beyond the middle of wing; the terminal abdominal segments are not yellowish; the subgenital plate and sternites are not completely reduced; and the hind TR is larger than 2.7.

**54. *Dasyhelea* sp. No. 1 (fig. 50, a, b).**

Small, pale-brown; antenna without terminal stylet, with scape pale brownish yellow and flagellar segments brown; thorax entirely pale brown; scutellum with three large median bristles; legs entirely yellow.

*Female:* Body about 1.14 mm. long. Wing 0.77 mm. by 0.29 mm.

Head with vertex brown, frons and mouthparts yellow, eyes very narrowly separate at vertex; clypeus with five setae. Maxillary palp with five segments in proportion of 5:12:7:8. Antenna with scape pale brownish yellow and flagellar segments brown; basal short flagellar segments oval, segments 10 to 13 distinctly longer than preceding ones and each with short neck part, ultimate segment longer than penultimate and blunt at tip; AR about 0.93 (70:74.5); proportion of distal eight segments about 9:10:10.5:13:14:14.5:13:17.5.

Thorax entirely pale brown; postscutellum slightly more brownish; scutellum with two large lateral and three large median bristles and without small accessory setae. Legs entirely yellow; distal seven segments in proportion of 72:71:42:17:13:10:11 in fore leg, 97.5:86:50:18:13:10:10 in middle leg, and 94:87:55:20:16.5:12:11 in hind leg.

Wing relatively long, differing from those of other major females of the genus, with macrotrichia rather dense, cell  $M_4$  and anal cell with many trichia on membrane, main anterior veins pale brown. Venation: Costa ending far beyond middle of wing (32.5:58),  $R_s$  a little shorter than R (12.5:14.5) and about 0.7 times as long as  $R_1$  (12.5:7.5), first radial cell absent, second cell about two-thirds as long as stem (18:27) and its inner space slit-like, stem of fMCu about 1.66 times as long as R, fMCu and tip of  $Cu_1$  under tip of  $R_1$  and costal end respectively. Haltere very pale brown.

Abdomen with tergites brown, sternites highly reduced; tergites without pale punctures at bases of setae; pleural and sternal membranes very pale brown; cerci brown; spermatheca brown, round, and 17 by 16 units; subgenital plate with basal ring somewhat oval, anterior projection rather broad; caudal arms far separated arising from basal ring, strongly arcuate, rather slender, and forming wide concavity between bases of two arms.

*Male:* Unknown.

DISTRIBUTION: Marshall Is.

MARSHALL IS. ARNO: Ine I., female, June 1950, La Rivers.

This female somewhat resembles that of *D. flavicaudalis*; however, the thorax and abdomen are not yellow but pale brown, the wings are rather slender, about 2.7 times as long as wide and longer than 2.5 times those of *D. flavicaudalis*, and the spermatheca is subspherical and brown instead of suboval or subpyriform and yellow.

**55. *Dasyhelea* sp. No. 2.**

Rather small, pale-brown or yellowish, closely related to *gressitti*. However, this species is smaller in general size, has a scutellum with four median setae, and a much smaller spermatheca.

*Female:* Body about 1.24 mm. long. Wing about 0.77 mm. by 0.29 mm.

Head with vertex dark brown, frons and mouthparts brown; clypeus with about eight setae. Maxillary palp short and stout and with five segments in proportion of 7:6:

10:6:7. Antenna all brown, flagellar segments rather long and tapered, segments 10 to 13 hardly three times as long as wide, last segment narrowed apically, but not sharply pointed and without distinct terminal stylet; AR about 0.93 (76:81.5); proportion of distal eight segments about 9.5:11:12:15.5:15:15:14.5:17.

Thorax with scutum pale brownish yellow, scutellum and postscutellum somewhat more brownish, pleural and sternal sclerites pale brown, scutellum with two large lateral and four large median bristles and two small accessory setae. Legs almost entirely yellowish brown, but knee joints brown; proportion of leg segments, except for basal two, about 76.5:80:48.5:?:?:?:? in fore leg, 101:101:47.5:18:16.5:11.5:9 in middle leg, and 96:89:57:23:20:14:9.5 in hind leg.

Wing with macrotrichia rather dense, cell  $M_4$  and anal cell with many trichia on membrane, costal and radial veins brown. Venation: Costa ending at middle of wing (30:60),  $R_s$  rather long, about 0.8 as long as  $R$  (10.5:13.5) and about 1.6 times as long as  $R_1$  (10.3:6.5), first radial cell absent, second cell about 0.65 as long as stem, stem of fMCu about 1.7 times as long as  $R$  (23:13.5), fMCu under tip of  $R_1$ ,  $Cu_1$  ending just beyond costal end. Haltere all brown.

Abdomen with tergites brown, sternites highly reduced and pale yellow, pleural membranes slightly fuscous, pale punctures at bases of tergal setae absent; cerci yellowish brown; spermatheca small, oval, brown, about 17 by 11 units and with short, yellow chitinized duct; subgenital plate closely similar to that of *D. gressitti*.

*Male*: Unknown.

DISTRIBUTION: Western Caroline Is.

PALAU. KOROR: Female, Nov. 1947, Dybas.

## 56. *Dasyhelea flavibasalis* Tokunaga (fig. 50, c-h).

*Dasyhelea flavibasalis* Tokunaga, 1940, *Tenthredo* 3 (2): 173 (Ponape).

Minute, brown; antennal terminal stylet completely absent, scutellum yellow, with two large lateral and two large median bristles and without small accessory median setae; wing with sparse macrotrichia on distal parts, radial and costal veins very pale brown; haltere with knob yellow. In male, coxite of hypopygium short, subtriangular, style rather small and short, parameres symmetrical and with simple median lobe, pointed at ends.

*Male*: Body about 1.2 mm. long. Wing about 0.7 mm. by 0.25 mm.

Head brown, with mouthparts yellowish brown; clypeus with about six setae. Maxillary palp rather slender, pale yellow, with five segments in proportion of 3:5.5:10:4:9. Antenna with scape dark brown, flagellar segments and plumose hairs brown; segments 11 to 13 not distinctly different in shape from basal ones; last segment without terminal stylet; proportion of segments 2 to 10, 2 to 12, 11 to 14, and 13 to 14 about 80.5:102.5:48.5:26.5; distal eight segments in proportion of 7.5:7.5:7.5:8.5:10:12:11:16.

Thorax with scutum and postscutellum brown, scutellum yellow, pleural and sternal sclerites pale brown, but scutum somewhat paler above wing bases; scutellum with two large lateral and only two large median bristles and without small accessory median setae. Legs with coxae pale brown as in thoracic pleurites, trochanters, femora, and tibiae somewhat paler than coxae, tarsal segments very pale brown, articulations between segments almost all brown; leg segments, except for basal two, in proportion of 75:68:32:13:11.5:10:10 in fore leg, 89:80:40:15:13:10:10 in middle leg, and 82:75:40:17:15.5:11:11 in hind leg.

Wing with anal lobes obtuse, veins very pale brown, macrotrichia on membrane very sparse, distributed only along distal margins of cells  $R_5$  and  $M_1$  and in a line above and below distal half of vein  $M_1$ , above distal part of  $M_2$  and above entire length of  $M_{3+4}$ ; cell  $M_4$  and anal cell without trichia. Venation: Costa ending slightly beyond middle of wing (28.5:54),  $R_s$  about 0.57 as long as  $R$  and about 1.78 times as long as  $R_1$  (8:14:4.5), stem of fMCu about 1.93 times as long as  $R$  (27:14), first radial cell absent, second cell small, subtriangular and as long as stem, fMCu slightly beyond costal end. Haltere with stem yellowish brown and knob yellow.

Abdomen bicolored; first three segments pale brownish yellow and other caudal segments brown, without pale punctures. Hypopygium with sternite 9 transverse, with median caudal projection broad, rounded, and ending at base of aedeagus; tergite 9 broad, subtriangular, not pointed at caudal tip, and with pair of small, slender anal points. Coxite short, rather broad at base, about 1.5 times as long as basal width (21.5:14.5) and subtriangular; style rather short, as long as basal width of coxite (14.5:15.5), basal half rather thick and distal half tapered, curved slightly, and ending at double tip. Aedeagus small, transverse, not strongly projected caudad, basal edge slightly arcuate, and lateral points slightly extended laterad, paired caudal lobes double-curved, strongly convergent and somewhat asymmetrical; parameres symmetrical, median lobe simple, as long as coxites (21:21.5), slightly undulate, pointed at both ends, basal arms gradually broadened laterad and curved caudad, than laterad.

*Female*: Body length about 0.98 mm. Wing about 0.62 mm. by 0.26 mm. General coloration dark brown and yellow.

Head mainly brown, with mouthparts yellow, proboscis very short, eyes very narrowly separated above; clypeus with six setae. Maxillary palp yellow, segment 3 with few spoon-like sensory hairs on basal part; four segments in proportion of 6:9.5:5:7.5. Antenna

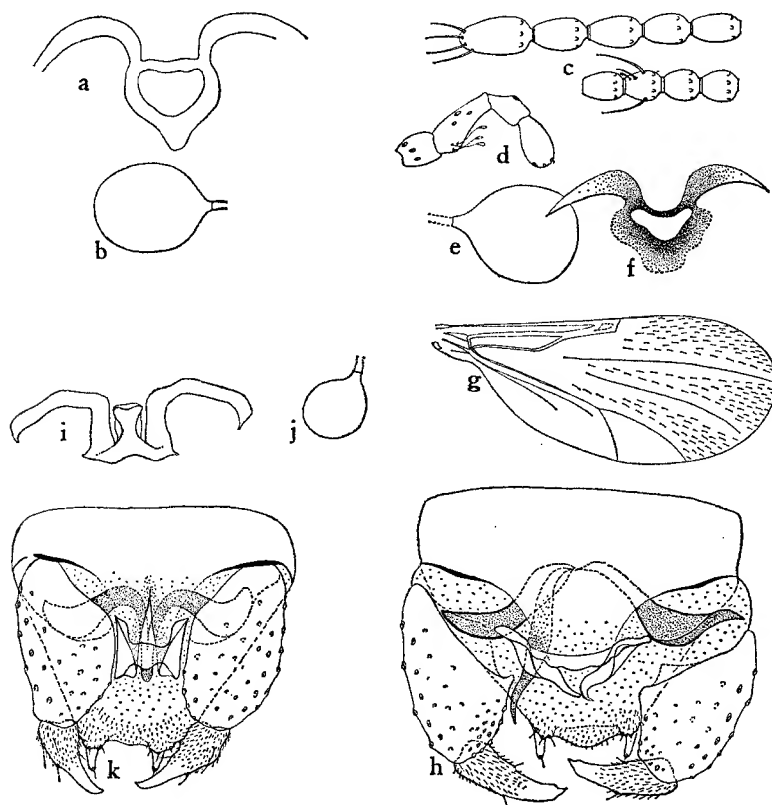


FIGURE 50.—a, b, *Dasyhelea* sp. No. 1: a, subgenital plate; b, spermatheca. c-h, *D. flavibasalis*: c, apical nine flagellar antennal segments, female; d, maxillary palp, female; e, spermatheca, female; f, subgenital plate, female; g, wing, female; h, hypopygium, male. i-k, *D. raripilosa*: i, subgenital plate; j, spermatheca; k, hypopygium, male.

with scape dark brown, other segments brown, short basal flagellar segments subspherical to short-oval and each with three hyaline sensory setae and minute spoon-like sensilla beside basal verticils, distal five segments oval and without surface sculpture, last segment with apex quite round and with about four hyaline sensory hairs; AR about 0.77 (0.73-0.81); relative length of distal seven segments about 6.9:7:8.1:8.9:9:9:12.8.

Thorax almost entirely dark brown, but scutum with lateral sides yellowish above bases of wings and scutellum entirely yellow; two scutellar bristles on middle part and one on either lateral part. Legs with coxae brown, but paler on mesal halves, other segments entirely pale brownish yellow; hind TR about 2.3; hind tibial comb with six apical bristles; relative length of leg segments, except for basal two, about 63:57:30:13:11:9:9 in fore, 76:74:38:14.5:13:10:8.5 in middle, and 73:69:39:17:14:11:9.5 in hind leg.

Wing with macrotrichia very sparse, cell  $M_4$  and anal cell without macrotrichia and stigmal area pale brown. Venation: Costa ending slightly beyond middle of wing length (26:48) and above tip of  $Cu_1$ , relative length of R, M, stem of fMCu and Rs about 13:10:20:8.5, Rs about twice as long as r-m (30:15) and about 1.5 times of  $R_1$  (30:19), second radial cell obscure, but seems to be much shorter than its stem (12:17),  $M_{3+4}$  about 1.8 times of  $Cu_1$  (14:8), fMCu under tip of  $R_1$ . Haltere yellow.

Abdomen with basal two segments, last segment, and cerci yellow, other tergites brown, pleural membranes pale brownish fuscous, tergite 3 with subtriangular brown cloud on posterior part, sternites of segment 3 and 4 subdivided into paired hemisternites and those of following segments complete. One spermatheca dark brown, short-oval (2+15 by 13 units) and with short, conical, chitinized part of duct; subgenital plate pale with cordiform basal ring and rather small lateral arms.

DISTRIBUTION: Eastern Caroline Is., Marshall Is.

Allotype, male (US 64603), Sydney Pier, Jaluit Atoll, Marshall Is., Aug. 1946, Townes.

MARSHALL IS. ENIWETOK: Two males, female, Jobtan I., at light, Aug. 26, 1956, Tuthill.

# **57. *Dasyhelea raripilosa* Tokunaga (fig. 50, i-k).**

*Dasyhelea raripilosa* Tokunaga, 1940, *Tenthredo* 3 (2): 172 (Palau).

Large, distinctive; scutum with brown and yellow markings; scutellum yellow and with three large median bristles; antenna with last segments much longer than preceding segments and somewhat pointed, but without terminal stylet; wing with macrotrichia sparse; haltere with knob yellowish pale brown or pale brown. In male, abdominal tergites with very minute but distinct hyaline punctures at bases of setae, hypopygium with style short and stout, aedeagus with paired lobes flattened and fused with basal bar and parameres symmetrical and without independent median lobe. In female, wing veins  $R_1$  and Rs thickened, abdominal tergites without pale punctures at bases of setae, spermatheca small, round, or short oval.

*Male*: Body about 1.87 mm. long. Wing about 1.06 mm. by 0.32 mm.

Head with vertex brown, frons and mouthparts pale yellow; clypeus with six setae. Maxillary palp with five segments in proportion of 3:12:14.5:9:11.3. Antenna with scape deep brown, flagellar segments and plumose hairs all brown, last segment much longer than preceding ones, somewhat pointed but without terminal stylet; proportion of segments 2 to 10 and 11 to 14 about 91:108.5; distal eight segments in proportion of 11:11:11:11:24:20.5:19.8:27.

Thorax: Scutum extensively brown, broad brown vittae confluent, shoulder parts with small brown spot; four pairs of yellow spots: Pair of oblong larger spots on caudoscuteal area, two pairs of small spots on shoulder parts, and pair of oblong spots on lateral sides of posterior part. Scutellum yellow, with two large lateral and three large median setae and without small accessory setae; postscutellum, pleural and sternal sclerites brown. Legs

mainly very pale brown, but femora and tibiae slightly more brownish, articulations brown; leg segments, except for basal two, in proportion of 95.5:92:50.5:19:15.5:11.8:13.5 in fore leg, 122:108:60.5:22:17.5:12.5:13.5 in middle leg, and 116:107.5:68.8:30.5:24.5:15.3:15.5 in hind leg.

Wing with costal and radial veins pale brown, macrotrichia very sparse, distributed only on apical parts of cells  $R_5$  and  $M_1$ . Venation: Costa ending far beyond middle of wing (43.8:81.3),  $R_s$  short, only about two-fifths of  $R$  (10.5:25), about 1.4 times as long as  $R_1$  (10.5:7.5), first radial cell absent, second cell small, only about one-third as long as stem (9.5:30), stem of fMCu about 1.46 times as long as  $R$  (36.5:25), fMCu under tip of  $R_s$ . Haltere with stem pale brown and knob yellowish pale brown.

Abdomen with tergites brown, hyaline punctures at bases of tergal setae minute but distinct, pleural membranes and sternal side almost uniformly pale brown. Hypopygium: Sternite 9 with broad spinulose membrane continuous with aedeagal lateral lobes; tergite 9 long, much longer than basal width, tapered, slightly concave at caudal margin, and with pair of slender cylindrical anal points. Coxite little longer than 1.5 times width (24.8:15) and somewhat oval in ventral aspect; style short, stout, thickened on basal parts, tapered, almost straight and as long as basal width of coxite. Aedeagus rather large, its basal arch broad and semicircular, basal bar rather broad and bluntly projected caudad at middle, paired lateral lobes fused with basal bar and rather broad lateral parts folded mesad; parameres symmetrical, without independent median lobe, basal arms strongly angulate in L-shape, mesal slender parts converged caudad and fused at tips forming median-lobe-like projection, lateral parts broadened and forming round broad lateral ends at junctions to bases of coxites.

*Female:* Body about 1.64 mm. long. Wing about 0.91 mm. by 0.34 mm.

Coloration generally as in male. Head pale yellowish brown, with mouthparts yellow, frontal tubercle short oval, proboscis a little longer than half of vertical length of head capsule (11.3:20); clypeus with five or six setae. Maxillary palp with five segments in proportion of 3.8:8.5:13:7.8:9.6. Antenna with scape deep brown, flagellar segments brown, segments 10 to 13 only slightly longer than preceding ones, last segment longest, about twice as long as penultimate and somewhat pointed, but without terminal stylet; AR about 0.86 (60.2:70.3, from 0.8 to 0.91); proportion of distal eight segments 8.7:8.9:9.1:10.5:11:10.5:10.1:18.9.

Thorax with coloration and scutellar chaetotaxy as in male. Legs almost entirely very pale brownish yellow, with articulations between segments brown; leg segments, except for coxae and trochanters, in proportion of 80.6:76.8:54.4:15.1:12.4:9.6:11.2 in fore leg, 105.2:99.9:55.2:17.8:14.3:11.1:12.4 in middle leg, and 97.2:89.8:62.4:25.6:20:12.8:13 in hind leg.

Wing with costal and radial veins pale brown, stem of second radial cell and veins around second radial cell thickened, macrotrichia rather sparse, cell  $M_4$  with only several (3-10) trichia and anal cell with about 20 trichia arranged in a line along anal margin but distinctly separate from anal margin. Venation: Costa ending slightly beyond middle of wing (38.8:68.8),  $R_s$  little shorter than  $R$  (15.2:17.6) and about 1.7 times as long as  $R_1$  (15.2:9), first radial cell absent, second radial cell slit-like, about 0.62 as long as stem (22:35.6), stem of fMCu about 1.46 times as long as  $R$  (25.7:17.6), fMCu under or slightly before tip of  $R_1$ ,  $Cu_1$  ending just under or sometimes slightly beyond tip of  $R_s$ . Haltere entirely pale brown.

Abdomen with tergites brown, without pale punctures at bases of tergal setae, sternites highly reduced, pleural and sternal membranes very pale brown; cerci pale brown; subgenital thickening with two arms angulately curved, showing almost uniform width, median part somewhat truncate basally and with small median subsquare process; spermatheca single, brown, small short oval or round, about 11 by 8.5 units, with minute hyaline dots and with small, slightly curved, chitinized duct.

DISTRIBUTION: Western Caroline Is.

Allotype, male (CM), Peleliu I., Palau Is., Aug. 1945, Dybas.

PALAU. BABELTHUAP: Ulimang, two females, Dec. 1947, Dybas; Ngarem-lengui and Ngiwal, 18 females, light trap, June 1957, Sabrosky. KOROR: Female, at light, Nov. 1947, Dybas. PELELIU: North central part, three females, at light, Aug. 1-7, 1945, Dybas; female, Aug. 1945, Hagen; two females, three males, same data as for allotype.

This species is rather distinctive in the coloration of the scutum, the arrangement of macrotrichia on the female anal wing cell, and the structure of the male hypopygium and the female subgenital plate. It is rather peculiar that the present species is not as yet known from the islands of Micronesia other than Palau.

**58. *Dasyhelea parvistylata* Tokunaga and Murachi, n. sp. (fig. 51, a-f).**

Rather large, dark-brown; antenna without terminal stylet and with round apex; scutellum yellowish brown or yellow, with four or five large median bristles and one to four small accessory setae; wing with slit-like first radial cell; haltere with knob yellowish or brownish; abdomen almost entirely dark brown or brown on dorsal side and without pale punctures at bases of setae. In male, hypopygium small, with style far shorter than coxite, stout, almost entirely pubescent and with small bare apex, aedeagus small, with a trapezoid chitinized plate beneath paired lobes, parameres symmetrical and with rod-like median lobe. In female, abdomen with distinct intersegmental yellow bands, spermatheca oval and without chitinized duct, subgenital plate without basal ring and its basal plate subdivided into two plates.

*Male:* Body about 1.71 mm. long. Wing about 0.96 (0.9-1.01) mm. by 0.29-0.3 mm.

Head brown or dark brown, with mouthparts pale or yellowish brown, eyes almost broadly contiguous above, frontal tubercle round; clypeus with nine to 11 setae. Maxillary palp rather slender, with five segments in proportion of about 3.7:6.7:19.5:8.2:11.3. Antenna with scape dark brown, flagellar segments and plumose hairs brown; proportion of distal eight segments about 10.5:11.5:11.8:12.3:26.8:28:23.3:24.5; segments 2 to 10 and 11 to 14 in proportion of 102.5:110.

Thorax almost entirely dark brown or brown, but scutellum paler or yellow and with two large lateral and four large median bristles and one or two small accessory median setae. Legs with coxae and last tarsal segments more or less brownish, other segments yellowish pale brown, but bases of tibiae and sometimes middle part of hind femur brownish; proportion of leg segments, except for basal two, about 98.3:104.3:65.3:25:18.3:13:12.7 in fore leg, 119:121.7:62.7:27.7:20:13.3:12 in middle leg, and 112:113.3:75:35.7:25.7:15.7:13 in hind leg.

Wing with macrotrichia rather sparse, costal and radial veins pale brown or brown. Venation: Costa ending far beyond middle of wing (42.7:73.7), Rs about two-thirds as long as R and 1.6 times as long as  $R_1$  (14.3:22.3:9), first radial cell present and slit-like, second cell rather long and a little shorter than first cell (6.3:7.8), stem of fMCu about 1.5 times as long as R (33:22.3), fMCu under tip of  $R_1$ , tip of costa above or just beyond tip of  $Cu_1$ . Haltere with stem brown and knob yellowish brown or yellow.

Abdomen with tergites uniformly dark brown or brown, sternites reduced on anterior segments; pleural and sternal membranes brownish fuscous. Hypopygium small; sternite 9 transverse, median part of caudal margin obscure; tergite 9 semicircular and almost without anal points. Coxite oval in ventral aspect, about 1.5 times as long as wide (24.3:16.2), style only as long as width of coxite (15.5:16.2), stout, pubescent and with tips somewhat pointed, slightly curved, and bare. Aedeagus small, with basal bar undulate and rather thick, trapezoid plate beneath aedeagal lobes which are somewhat claw-like; parameres symmetrical, with medial lobe rod-like, slightly longer than aedeagal caudal lobes (12:11.5), ending between aedeagal lobes slightly beyond aedeagal trapezoid plate at round tip,

basal arms slender, extending laterad and with lateral half broadened and somewhat rhombic.

*Female*: Body about 1.49 (1.38-1.69) mm. long. Wing about 0.88 (0.86-0.91) mm. by 0.35 (0.34-0.35) mm. General coloration dark brown, but with scutellum, knob of haltere and legs yellow or yellowish pale brown as in male.

Head largely brown, with mouthparts paler, eyes just separated above by a linear space, frontal tubercle somewhat cordiform, proboscis very short and about one-third as long as head capsule (6.5:20.5). Maxillary palp rather slender and scattered spoon-like sensillae on basal part of segment 2. Antenna brown, with AR about 1.02 (1.0-1.06), basal flagellar segments with neck parts and somewhat flask-shape, distal five segments distinctly longer than preceding ones; relative length of distal ten segments about 10.3:10.8:11.2:12:13.2:16.5:16.3:16.7:17.3:21.3.

Thorax almost entirely brown including pleural and sternal sclerites, but scutellum yellowish brown; scutellum with four median and two lateral bristles, median bristles ar-

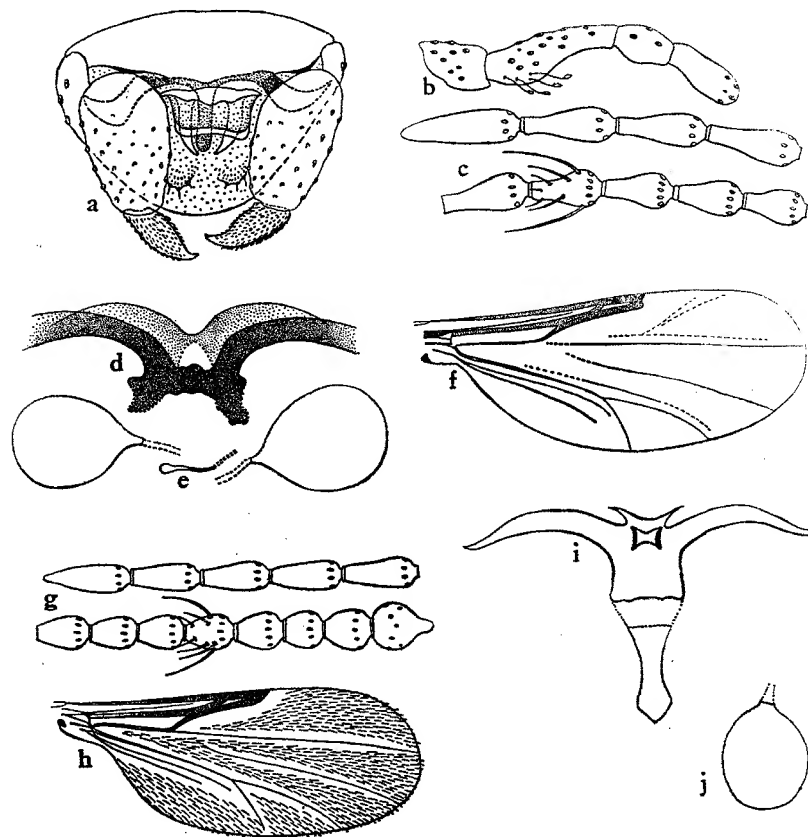


FIGURE 51.—a-f, *Dasyhelea parvistylata*: a, hypopygium, male; b, maxillary palp, female; c, distal nine antennal segments, female; d, subgenital plate, female; e, spermathecae, female; f, wing (macrotrichia omitted), female. g-j, *D. sp. No. 3*, female: g, flagellar antennal segments; h, wing; i, subgenital plate; j, spermatheca.



ranged in a semicircular line with one or rarely two central setae. Legs largely yellow, but middle and hind coxae somewhat brownish, with six or seven apical setae of hind tibial comb; TR of fore and hind legs about 2.74 (2.67-2.86) and 2.35 (2.32-2.39) respectively; relative length of leg segments, except basal two, about 83.7:89.3:56.7:20.7:15.7:11.3:11 in fore, 104:109.7:53.3:22.8:16.5:11.3:10.2 in middle, and 101:98.3:69:29.3:22:14:11.7 in hind leg.

Wing with veins fuscous, membrane very slightly fuscous, macrotrichia rather thickly spread all over surface, but bare areas along veins distinct. Venation: Costa somewhat beyond middle of wing (39.5:67.7), Rs about 1.7 times as long as  $R_1$  (14.3:5.8), first radial cell present, but slit-like, second cell opened and fully as long as first (5.8:5.3), R, M and stem of fMCu in proportion of 18.3:16.3:28.2, fMCu under septum between two radial cells, and  $M_{3+4}$  about twice as long as  $Cu_1$  (20.7:10.5). Haltere with stem brown and knob pale yellow.

Abdomen darker than thorax, tergites dark brown, pleural membranes dark and finely striate, sternites fuscous brown; sternites not reduced, but subsquare, each with pair of hyaline oval spots at middle and four or five setae on either lateral side and nine or ten setae on caudal margin; two spermathecae, well developed, brown, short-oval, slightly unequal (1+15.7 by 13.3 units and 1.8+17.7 by 14 units) and each with a small neck part of duct, and one minute, but brown, slightly swollen at bottom and with slender chitinized duct (3+1.8 by 1.5 units); subgenital plate with basal plate not ringed, but irregularly curved and two lateral arms rather broadly separated from each other at bases, arcuate, and almost uniform in breadth.

Holotype, male (US 64034), Mt. Madaade, near Yaptown, Yap, July 12, 1946, Townes. Allotype, female (US), Koror, Palau, light trap, May 2, 1957, Sabrosky. Paratypes, Palau: Female (CM), Koror, Jan. 16, 1948, Dybas; seven females, five males (with allotype), Koror, May 2, 1957, light trap, Sabrosky; female, Malakal, May 2, 1957, Sabrosky; male (US), Peleliu, July 23, 1946, Townes; female, Angaur, Feb. 5, 1948, Dybas. Yap: Male (BISHOP), Yap, Hill behind Yaptown, 60 m., Nov. 29, 1952, Gressitt.

DISTRIBUTION: Caroline Is. (Palau and Yap).

This species is characteristic in the possession of two radial cells, although they are very narrow, distinctly differing from the known Micronesian species. The male may be easily distinguished by the short styles of the hypopygium, the symmetrical parameres, the aproned aedeagus, and the absence of the anal point.

### 59. *Dasyhelea* sp. No. 3 (fig. 51, g-j).

*Female*: Body about 1.76 mm. long. Wing about 0.98 mm. by 0.38 mm. General coloration as in male of *D. parvistylata*.

Head almost entirely dark brown; clypeus with about eight setae. Maxillary palp with segment 2 rather slender and without special sensory hairs, segments in proportion of 5:8:22:8:11. Antenna dark brown, with basal flagellar segments subspherical to short-oval, each with several hyaline sensory setae as well as verticils; distal five flagellar segments elongate, without surface sculpture and last segment tapered apically and somewhat pointed; AR about 0.95 and relative length of segments, except basal one, about 12:9.5:9.3:9:9.5:9.2:9.5:10.4:14.5:14.5:14:13.2:17.

Thorax almost uniformly brown, but scutum somewhat yellowish or paler on caudoscuteal area and lateral sides of caudal half above wing bases; scutellum pale or yellowish but lateral sides brown. Legs with basal four segments and last tarsal segments fuscous and basal four tarsal segments somewhat paler; proportion of leg segments, except

basal two, about 98:103:60:26:20:16:15 in fore leg, 125:127:65:28:21:15:14 in middle leg, and 120:118:72:35:27:20:15 in hind leg; hind tibial comb with five or six apical bristles.

Wing slightly dark, densely clothed with rather long macrotrichia as in some *Forcipomyia* species and bare areas along veins very much obscure, two radial cells somewhat dark brown. Venation: Costa ending far beyond middle of wing (41:72), Rs entirely separate from  $R_1$ , about 0.8 as long as R, and 1.88 times as long as  $R_1$  (15:19:8), first radial cell slit-like, second cell long, subtriangular and subequal to first cell in length, stem of fMCu about twice as long as Rs and about 1.58 times as long as R (30:15:19), fMCu just before tip of  $R_1$ , Cu<sub>1</sub> ending before costal end. Haltere entirely brown.

Abdomen almost entirely dark brown, sternites not reduced; intersegmental yellow bands distinct; cerci dark brown; spermatheca oval, brown and apical part yellowish, without chitinized duct, and about 17 by 41 units; subgenital plate without basal ring, basal parts subdivided into a longer plate and a trapezoidal plate, caudal arms very widely divergent, V-shape, tapered, and curved laterally at distal one-third.

Male: Unknown.

DISTRIBUTION: Caroline Is.

YAP. YAP: Near Yaptown, female, July 1946, Townes.

This species is highly characteristic in the possession of a first radial cell and the very thickly spread macrotrichia of the wing and is distinctly different from the female of *D. parvistylata* in the number of spermathecae.

#### 60. *Dasyhelea subscutellata* Tokunaga (fig. 52).

*Dasyhelea subscutellata* Tokunaga, 1940, *Tenthredo* 3 (2): 175 (Palau); 1941, *Annot. Zool. Japon.* 20 (2): 111 (Truk).

Medium-size, shiny; scutum almost entirely dark brown or with three brown vittae in yellow ground color, scutellum yellow and with two lateral and five or six median bristles and often with one to five accessory small median setae; general coloration greatly similar to that of *D. palauensis*. In male, median lobe of parameres with apical two arms not strongly curved but almost straight, highly differing from *D. palauensis*. In female, dark form not known, all being striped form, spermatheca round and with many dark dots, subgenital plate with subsquare basal ring and V-shape caudal arms.

Male: Body about 1.45 mm. long. Wing about 0.88 mm. by 0.27 mm.

Head dark brown to brown; mouthparts pale brown; clypeus with nine or ten setae. Maxillary palp pale yellow, with five segments in proportion of 4:5.8:14.5:6.5:9.5. Antenna with scape dark brown, flagellum and plumose hairs brown; segments 2 to 10 and 11 to 14 in proportion of 88.5:68.5; proportion of distal eight segments about 8.8:8.8:9:9.3:17.5:18:15.8:18; last segment without terminal stylet.

Thorax in dark form, with scutum extensively dark brown to brown, with pair of small, oval pale spots on caudoscuteal area and yellow oblong spot on lateral sides of caudal half. In striped form, scutum with three large brown vittae separated by slender yellow stripes along foveae, large yellow humeral spots and pair of oval yellow spots connected by yellow stripes on pale-brown caudoscuteal area. Median brown vitta subdivided by slender yellow stripe along mid-dorsal line, lateral margins of caudal half of scutum rather broadly yellow; scutellum yellow, somewhat brownish on lateral parts, with two lateral and five median bristles and usually one accessory small median seta, but sometimes accessory seta absent and rarely one of five median bristles reduced to small seta; pleural and sternal sclerites brown or pale brown. Legs with coxae brown or pale brown, other segments far paler, but in dark form fore and hind femora with broad brownish clouds on middle parts and last tarsal segments more brownish; leg segments, except for basal two, in proportion of 86.3:85:47:18.8:16:13:12.3 in fore leg, 102.7:102.3:49:20:17.5:13:12.5 in middle leg, and 94.7:91.3:52.7:23.3:19.7:13.3:12.3 in hind leg.

Wing with costal and radial veins pale or very pale brown, macrotrichia of membrane very sparsely arranged on distal part and cell  $M_4$  with eight to ten trichia, bare areas along veins broad. Venation: Costal end a little beyond middle of wing (34.3:65.3),  $R_s$  about half as long as  $R$  (9.5:19.5) and straight, first radial cell absent, second cell incomplete, distal and basal veins (free parts of  $R_s$  and  $R_1$ ) being more or less atrophied and about 0.74 as long as stem (14:19), relative length of  $R$ ,  $R_1$ ,  $R_s$ , and stem of fMCu about 19.5:5.3:9.5:29.7, fMCu just beyond level of tip of costa. Haltere with stem brown and knob yellow or yellowish pale brown.

Abdomen uniformly dark brown or brown, sternal and lateral membranes fuscous, pale tergal bands and punctures at bases of setae absent. Hypopygium dark brown; sternite 9 transverse, without setae, middle part broadly expanded caudad beneath aedeagus, and ending little before tip of tergite, blunt at tip and its shoulder parts obtuse; tergite 9 little shorter than basal width, trapezoid, truncate at tip, and with pair of minute anal points. Coxite rather slender, a little longer than twice width (35.5:16.5); style slightly undulate, tapered, not sharply pointed and about 0.7 as long as coxite (25.5:35.5). Aedeagus very short, transverse, consisting of a basal, strong, bow-like arch, pair of small

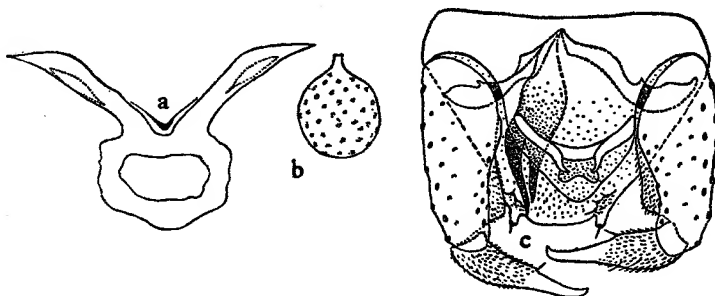


FIGURE 52.—*Dasyhelea subscutellata*: a, subgenital plate; b, spermatheca; c, hypopygium, male.

hook-like processes arising from basal arch and small membranous median lobe between hook-like processes; parameres with large median lobe and a pair of basal arms; median lobe about 3.5 times as long as wide (33.2:9.7), about as long as coxite (33.2:35.5), pointed basally and bifurcate apically into subequal lobes which are about half as long as median lobe and almost straight; basal arms somewhat symmetrical, somewhat broadened on lateral parts, and ending at dorsal part of basal edge of coxites.

*Female*: Body about 1.62 mm. long. Wing about 0.83 mm. by 0.33 mm. Coloration as in striped form of male.

Head dark brown, with frontal tubercle rhombic or square, eyes very narrowly separated above, mouthparts brown; clypeus with about ten or 12 setae. Maxillary palp pale yellow and with five segments in proportion of 4:6.7:16.8:7.8:9.2. Antenna without terminal stylet, short basal segment oval and about 1.5 times as long as wide, segments 10 to 13 oblong and about twice as long as wide, ultimate segment about 2.5 times as long as wide and apical end blunt; AR about 0.84 (63.8:76); distal eight segments in proportion of 9.5:9.5:9.8:11.7:12:12.5:12:16.

Thorax with three brown vittae on yellow ground color of scutum, median vitta not extending onto caudoscuteal area and lateral vittae ending cephalad before yellow shoulder parts, scutellum yellow with six large median and two large lateral bristles and three to five small median accessory setae, other sclerites all brown. Legs almost entirely yellowish pale brown, but all articulations and last tarsal segments somewhat more brownish;

proportion of leg segments from femora to tarsi about 90.7:89.3:51.7:20.3:17.7:13:13.3 in fore leg, 107.3:109:55:21.3:18.7:13.5:13.3 in middle leg, and 103:98.3:70.3:26.5:21.7:15:14.3 in hind leg.

Wing oval, with macrotrichia rather dense, but bare areas along veins broad, cell  $M_4$  with about 30 trichia and anal cell with many trichia, stigmal area brown, costal and radial veins pale brown. Venation: Costa far beyond middle of wing (33.5:62.5),  $R_s$  much shorter than  $R$  and a little shorter than twice of  $R_1$  (11.5:15.3:6.8), first radial cell absent, second cell about 0.63 as long as stem (17:27) and inner space obliterated, stem of  $fMCu$  about 1.6 times as long as  $R$  (24.3:15.3:),  $fMCu$  under tip of  $R_1$ ,  $Cu_1$  ending under costal tip. Haltere with stem brown and knob yellow.

Abdomen with tergites brown, sternites more or less reduced and paler, pleural membranes brown; tergites with dark setae and yellowish intersegmental bands and without pale punctures at bases of setae; cerci yellowish pale brown; spermatheca brown, round, with dark dots and small chitinated duct and about 17.2 by 14 units; subgenital plates with subsquare basal ring and pair of caudal arms which arise from caudal side of basal ring, are divergent widely, almost straight, thickened on mesal sides, and almost uniform in width.

DISTRIBUTION: S. Mariana Is., Caroline Is.

S. MARIANA IS. SAIPAN: As Mahetog, male, May 1945, Dybas; Susupe Lake, Jan. 1949, Maehler; Afenia, female, June 1946, Townes. GUAM: Two males, light trap, June 29, 1945, Gressitt; Fadian, male, June 1945, Dybas; Mt. Alutom, male, Apr. 1946, Townes; Yigo, two females, two males, Oct. 1957, Krauss.

TRUK. PIs: Two males, June 1946, Townes. FEFAN: Male, May 1946, Townes.

PONAPE. Sokehs I., 2 m., female, Jan. 1953, Gressitt.

This species is very closely related to *D. palauensis*, especially in the structure of the male hypopygium, but these two species in the case of the male may be distinguished rather easily by the different shape of the median lobes of the parameres and in the case of the female by the characteristic structure of the spermathecae and the subgenital plates.

#### 61. *Dasyhelea dupliforceps* Tokunaga, n. sp. (fig. 53).

Small; coloration distinctly different sexually. Male mainly dark brown, scutum with pair of small dark spots on yellow shoulder parts. Female yellow and brown, scutum with four brown vittae, accessory small lateral brown vittae and small brown shoulder clouds. Antenna of male with basal small flagellar segments rather flattened and rather closely united, but sutures between these segments distinct, four distal segments cylindrical; female antenna with basal short flagellar segments spherical and AR about 0.86. Scutellum yellow and with four median bristles. Hind TR about 2.36-2.52 in male and 2.75-2.82 in female, hind femur and all tibiae broadly brownish on middle parts. Wing of male with macrotrichia sparse, several on cell  $M_4$ , and absent on anal cell. Male hypopygium highly specific in possession of bifurcate sternal process, golf-club-like caudal lobe of parameres, strong apical projections of coxites and strongly curved large styles. Female subgenital plate without basal ring, but with characteristic funnel-like basal structure. Abdominal sternites reduced into small sclerites, in male sternites 4 to 6 and in female sternites 5 and 6 subdivided into hemisternites and following complete.

*Male*: Body length about 1.41 mm. Wing about 0.88 mm. by 0.27 mm.

Head dark brown, with eyes very narrowly separated above, mouthparts pale and slightly fuscous, proboscis about one-third as long as height of head capsule (7.5:20);

clypeus with 6 to 9 small setae. Maxillary palp stout, pale, slightly fuscous and with four segments in proportion of 7.3:10.5:6.8:8.3; segment 3 a little longer than wide and with few sensillae on basal half of ventral side. Antenna almost entirely dark or dark brown; segment 2 with petiole rather long; segment 3 widely separated from 2; segments 3 to 9 shorter than wide and rather closely united, but sutures between these segments present and plumose hairs normally developed; distal five with slightly developed reticular sculpture on surface and single nodes on basal parts; relative length of segments 2 to 9, 10 to 14, 2 to 10, and 11 to 14 together about 65.3:100.5 and 77:88.5 respectively, distal eight segments in proportion of 7:7:7.5:13.5:20:21:20:25.

Thorax generally dark brown, scutellum yellow and with four median bristles beside lateral two, scutum with pair of dark small spots on yellow shoulder parts and pair of slender brown but rather distinct stripes on foveae. Legs mainly pale brownish yellow,

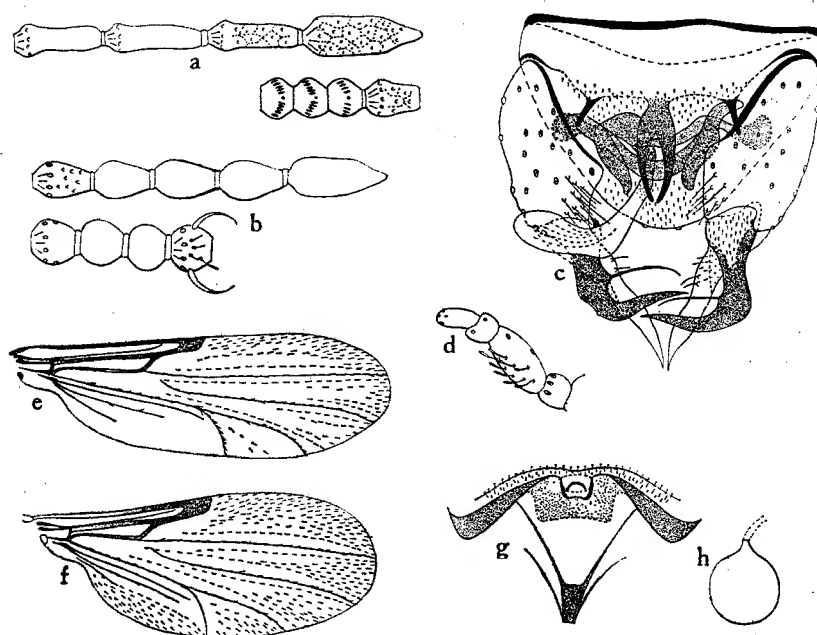


FIGURE 53.—*Dasyhelea dupliforceps*. a, apical eight antennal segments, male; b, apical nine antennal segments, female; c, hypopygium, male; d, maxillary palp, female; e, wing, male; f, wing, female; g, subgenital plate; h, spermatheca.

with coxae brown, knee joints dark brown, middle parts of hind femur and all tibiae broadly brownish, last tarsal segments more or less brownish; hind tibial comb with seven or eight apical bristles, TR of hind leg 2.36-2.52; relative length of leg segments, except for basal two, about 89.5:88.5:51:18:16.3:12.3:14.5 in fore, 107.5:105:53:19.5:17:13:14 in middle, and 98:94.5:61:25:19.5:13.5:15 in hind leg.

Wing with stigmal area and main veins very pale brown, macrotrichia very sparse, anal cell without trichia, cell  $M_4$  with a few trichia. Venation: Costa ending just before middle of wing (32.8:67.5), R, M and stem of fMCu in proportion of 18.3:16.3:29.5, Rs about 1.5 times as long as  $R_1$  (9:6), second radial cell about one-third as long as its stem,  $M_{3+4}$  little longer than twice  $Cu_1$  (18.5:8), fMCu under tip of costa and its inner angle about 37 degrees. Haltere with stem brown and knob yellowish pale brown.

Abdomen dark, but sternites brown, sternite 3 reduced into several minute sclerites at bases of setae, following two sternites reduced into hemisternites, other posterior ones subsquare. Hypopygium black, highly specific; tergite 9 somewhat triangular (27:48) but round on caudal margin; sternite 9 about a quarter as long as wide (12:48), with median large caudal process, longer than sternite (18:12) and deeply bifurcate, and pair of small dark rods on laterocaudal margins. Coxite about twice as long as wide (30:14), especially setigerous at mesal apical area, and with apical long process, almost as long as coxite (28:30), tapered, and sharply pointed; style large, longer than coxite (32:30), very strongly arcuate, sharply pointed, and with strong spine-like bristle at middle of mesal side. Aedeagus large, thickened, and with pair of stout lateral projections; parameres asymmetrical, one basal sclerite slender and the other sclerite stout and fused with median caudal lobe which is very large and golf-club-like, being curved and swollen beyond middle.

*Female:* Body about 1.04 mm. long. Wing about 0.75 (0.7-0.81) mm. by 0.32 (0.3-0.35) mm. Coloration of thorax distinctly different from that of male, but other structures similar to those of male with usual sexual differences.

Head dark brown, with mouthparts pale brown or slightly fuscous, proboscis little longer than one-third length of head capsule (7:19). Maxillary palp stout, with segment 2 oval and four segments in proportion of 5.5:10:6:6.8. Antenna with scape dark, flagellum dark brown or brown, short basal flagellar segments subspherical, apical five segments elongate-oval and without distinct reticular sculpture; AR about 0.82-0.90; distal eight segments in proportion of 7.8:7.5:8.8:10:10.5:10.5:10.5:15.8.

Thorax yellow and brown, scutum with four brown vittae, pair of short accessory lateral vittae and pair of small brown shoulder spots, caudoscuteal area obscurely brownish on caudal part, paratergites brown, scutellum yellow, postscutellum dark brown, pleural sides mainly yellow and with brown spots, sternal side brownish. Legs mainly yellow, but lateral sides of all coxae, bases of fore and hind trochanters, middle part of fore femur, distal two-thirds of hind femur, bases and middle one-third of all tibiae, and last tarsal segments brown, basal four tarsal segments white; hind tibial comb with six apical bristles; hind TR about 2.75-2.82; leg segments, except for basal two, in proportion of 72.5:74.5:37.5:14:12.3:10:12.8 in fore, 85.5:87:41.3:15.8:14:10:12 in middle, and 83.5:80:50.5:18.5:15.5:12:12.8 in hind leg.

Wing with stigmal area pale brown, anterior veins rather thick, macrotrichia rather sparse. Venation: Costa ending at middle of wing (30:58), R, M, and stem of fMCu with relative length about 14:11.5:23.5, Rs about 1.5 times as long as R<sub>1</sub>, second radial cell about half as long as its stem vein, M<sub>3+4</sub> about 1.7 times of Cu<sub>1</sub> (16:9.5), fMCu under tip of R<sub>1</sub> and its inner angle about 45 degrees. Haltere with knob yellow.

Abdomen with tergites dark brown, pleural membranes slightly fuscous brown, sternites pale brown and reduced: those of 2 to 4 reduced into small sclerites, those of 5 and 6 reduced into separated or subconfluent hemisternites. Subgenital plate with subsquare basal sclerite and opening and small funnel-like sclerite. Spermatheca round, about 2+11.8 units by 11.8 units and with short chitinized part of duct; cerci pale brown.

Holotype, male (BISHOP 2755), Betio I., Tarawa A., Gilbert Is.; Nov. 1957, Krauss. Allotype, female (BISHOP), Bairiki I., Tarawa A., Gilbert Is., Nov. 1957, Krauss. Paratypes, female, male, with holotype.

DISTRIBUTION: Gilbert Is. (Tarawa).

The male is somewhat allied to Micronesian *D. insularis* Tokunaga in coloration, but these two species are highly specific in the form of genital structures. The female is somewhat allied to Micronesian *D. furcillifera*, but the scutal marking and structures of the female subgenital plate are distinctly different.

62. *Dasyhelea townesi* Tokunaga and Murachi, n. sp. (fig. 54).

Rather large or medium-size; scutal color different in two sexes; in male scutum almost entirely dark brown with ill-defined paler clouds on shoulder parts, lateral parts covering scutal sutures and lateral parts of caudoscuteal area; female with five distinct brown vittae or pale yellowish brown ground color; ultimate antennal segment oblong or oval, short, not sharply pointed at tip, and without terminal stylet; scutellum yellow or yellowish pale brown, with two or three large median bristles and without accessory small setae; wing with macrotrichia sparse in male and rather dense in female, costal and radial veins brown or pale brown; haltere with knob yellow; legs brownish or fuscous, except for pale-brownish, hyaline, four basal tarsal segments. In male, wing cell  $M_4$  and anal cell without macrotrichia and hypopygium with median lobe of parameres unequally bifurcate at tip, basal arms of parameres rather broad, aedeagus rather large with basal

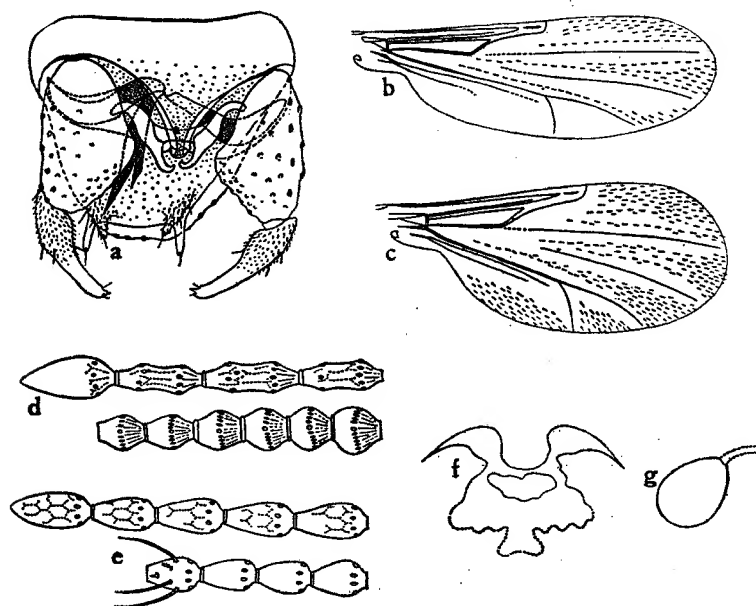


FIGURE 54.—*Dasyhelea townesi*: a, hypopygium, male; b, wing, male; c, wing, female; d, apical ten flagellar antennal segments, male; e, apical nine flagellar antennal segments, female; f, subgenital plate; g, spermatheca.

concavity somewhat semicircular and with pair of large caudal lobes, tergite 9 with distinct anal points. In female, spermatheca small and oval, subgenital plate with very large basal ring and pair of caudal arms arising separately from basal ring.

*Male*: Body length about 1.6 mm. Wing about 0.97 mm. by 0.22 mm.

Head dark brown, with eyes very narrowly separated above, frontal tubercle obscure; clypeus with about seven setae. Maxillary palp pale brown, rather slender, with last segments oval, five segments in proportion of 3:7:14:5.5:8. Antenna with scape dark brown, flagellum and plumose hairs brown, striation on basal parts of segments before verticils and without reticular surface sculpture, penultimate three segments with double nodes, ultimate segment broad and rather pointed at tip, without terminal stylet; combined relative length of segments 2 to 10 and 11 to 14 together about 84.3:63.8, distal eight segments in proportion of 8.3:8.5:8.7:8.3:14.1:16.8:15:17.5.

Thorax extensively dark brown, except for yellow scutellum with large lateral and two large median bristles and without small accessory setae. Basal leg segments from coxae to tibiae and ultimate tarsal segments brown or brownish fuscous, four basal tarsal segments pale brown; leg segments, except for basal two, about 88.5:82:44:17:16.3:14:13.5 in fore leg, 106:96.5:57.5:21.3:18:12.5:11.5 in middle leg, and 96:87:57.5:23.8:20.3:13:12.5 in hind leg.

Wing with costal and radial veins pale brown, macrotrichia very sparse, cell  $M_4$  and anal cell without trichia; in other marginal wing cells, trichia distributed only on apical parts and in lines along veins. Venation: Costa distinctly beyond middle of wing (36:67), stem of fMCu about 1.6 times as long as R (32:19.8),  $R_s$  hardly half as long as R and little shorter than 1.5 times of  $R_1$  (9:19.8:6.3), first radial cell absent, second cell incomplete or obsolete and about 0.53 as long as stem, fMCu just beyond level of costal end,  $Cu_1$  strongly curved and meeting with anal margin in angle of about 90 degrees. Haltere with stem brown and knob yellow.

Abdomen with tergites dark brown, sternites more or less reduced, membranous areas brownish; tergites with indistinct pale punctures at bases of setae. Hypopygium: Sternite 9 broad, subtriangular, projected caudad between caudal lobes of aedeagus ending in minutely angulate tip; tergite 9 rather long, tapered, and with pair of anal points, distinct, clavate, and rather long. Coxite conical, somewhat triangular in ventral aspect and 1.7 times as long as wide; style little shorter than coxite (21.9:26.5), basal one-third rather thick, then curved inward, and apical two-thirds almost straight, not distinctly tapered, and obliquely truncate at tip. Aedeagus rather large, its two chitinized lobes large, slightly sigmoid, widely separated basally, and convergent caudad, apically incurved and pointed, basal bridge at middle of paired lobes and basal concavity semicircular; parameres with median lobe fully as long as style (22.5:21.9), rather slender, slightly broadened apically, apically bifurcate unequally into pointed branches, dextral branch about twice as long as sinistral; basal arms symmetrical, broad, arcuate, and somewhat lunular in shape.

*Female:* Body length about 1.31 mm. Wing about 0.74 mm. by 0.31 mm. Coloration of scutum highly different from that of male but that of other parts similar to male.

Head dark brown, with mouthparts brown; clypeus with about seven setae. Maxillary palp rather slender; segment 2 slender, about equal to 3 and 4 together and with few spoon-like sensory hairs on ventral side, with five segments in proportion of 2:6.8:13.5:6:7.8. Antenna with scape deep brown, flagellum brown; basal short flagellar segments spherical to short-oval and each with three long and two short hyaline sensory hairs beside verticils, apical five segments oval and with poorly-developed reticular sculpture, last segment rather round at tip; AR about 0.87 (57:69); proportion of distal eight segments about 7.8:8.3:8.8:10.8:11.3:10.8:10.8:13.5.

Thorax: Scutum with five distinct brown vittae on pale yellowish-brown ground color, short lateral brown vitta on either lateral margin, broad, large brownish cloud on caudal part of caudoscuteal area, scutellum with two large lateral and two or three large median bristles and without small accessory setae, other sclerites brown. Legs with coxae, trochanters, femora, tibiae, last tarsal segments, and knee joints brown, but tibiae somewhat paler, basal four tarsal segments very pale brownish or yellowish hyaline; proportion of leg segments, except for basal two, about 78:74:41.5:16.5:15:12:11.5 in fore leg, 100:93.5:52.8:18.5:16.3:11.8:11.8 in middle leg, and 91:83.5:55.5:23:19.5:12.3:11.5 in hind leg, hind tibial comb with five or six apical bristles.

Wing with costal and radial veins and second radial cell brown; macrotrichia rather dense on distal half, very sparse in central part, and rather sparse in cell  $M_4$  and anal cell, cell  $M_4$  with about 17 to 20 trichia and anal cell with about 37 trichia on caudal half along anal margin, bare areas along veins broad. Venation: Costa ending beyond middle of wing (33:57.3),  $R_s$  about 0.7 as long as R and about 1.53 times as long as  $R_1$  (11.5:16:7.5), first radial cell absent, second cell small and about 0.56 as long as stem (15.5:27.5),  $M_{4+5}$  rather distinctly curved on distal part and ending on margin in right angle, stem of fMCu about 1.6 times as long as R (26:16), fMCu under tip of  $R_1$  or middle of second radial cell,  $Cu_1$  not strongly curved (differing from male), extending caudad and ending



at same level of fMCu, inner angle of fMCu large. Haltere with stem brown and knob yellow.

Abdomen with tergites brown, sternites complete, subsquare, each with about ten setae and paired oval hyaline spots, pleural membranes fuscous, tergites with indistinct pale punctures at bases of setae, segment 9, including cerci, pale brown; spermatheca oval, brown, 18 by 10 units, and without neck part; subgenital plate with basal ring subtrapezoid, flattened and with short but broad petiole part, caudal lateral arms rather small and widely separated at bases by U-shape concavity.

Holotype, male (US 64035), Bikajela Islet, Ailinglapalap Atoll, Marshall Is., Aug. 25, 1946, Townes. Allotype, female (US), Rota I., Mariana Is., June 23, 1946, Townes. Paratypes, male, near Sabana, Rota I., 360 m., June 23, 1946, Townes; female (BISHOP), Woleai Atoll, Utagal I., Caroline Atolls, July 24, 1946, Townes.

DISTRIBUTION: Mariana Is., central Caroline Is., Marshall Is.

This species is sexually dimorphic in coloration of the thoracic scutum: In the male the scutum is almost entirely dark brown and in the female is provided with three distinct brown vittae and a pair of short, brown additional vittae behind the shoulders on yellowish ground color. The male is somewhat allied to *D. fumala*, from which it can be easily distinguished by the large aedeagus and bifid median lobe of the parameres in the hypopygium. The hypopygium of this species is rather more closely allied to that of *D. nigroris*, from which, however, it differs in the arcuate style, the almost straight basal bar of the aedeagus, and the bifurcate median lobe of the parameres. The female is closely similar in coloration to *D. palauensis*, from which it can be distinguished by the absence of the terminal papilliform projection of the antenna. The name is given in honor of Dr. Henry K. Townes who has collected this midge.

### 63. *Dasyhelea pallivittae* Tokunaga, n. sp. (fig. 55).

Small, yellowish and brown or fuscous-brown, with subconfluent yellowish pale-brown scutal vittae on yellow ground color; scutellum yellow and with three or four median bristles and small central setae. Female wing rather densely clothed with macrotrichia; male wing with rather sparse macrotrichia. Male with highly specialized hypopygium: Sternite 9 with median caudal lobe, aedeagus with caudal and lateral hook-like processes, coxites with strong processes for articulation to aedeagus. Female with specific subgenital plate, with rather long petiole part of basal ring.

*Male*: Body about 1.22 mm. long. Wing about 0.75 mm. by 0.23 mm.

Head yellowish brown, with mouthparts yellow, proboscis about one-third as long as height of head capsule (6:17), eyes just contiguous above, frontal tubercle yellowish and subrhombic; clypeus with about eight marginal setae. Maxillary palp yellow, rather slender, with about four spoon-like sensory hairs on basal part of segment 2 and with four segments in proportion of 5:13.5:6:9. Antenna brown; flagellar segments with striation on basal parts before verticils, segment 11 with double nodes and poorly sculptured reticularly, distal three segments missing.

Thorax extensively yellow, scutum with four faint, pale-brown vittae, subconfluent and ill-defined, scutellum with four median and two lateral bristles and one central small seta. Legs entirely yellow, except for brownish knee joints; hind TR about 2.29, hind tibial comb with five or six apical bristles; relative length of leg segments, except for basal two, about 74:70:38:16.5:14.5:11: ? in fore, 84:89:42:18:15:11: ? in middle, and 79:77:47:20.5:17:12: ? in hind leg.

Wing with anterior veins pale brown, stigmal area also pale brown, macrotrichia rather sparse, but distributed along entire caudal margin. Venation: Costa ending just beyond middle of wing (30:57.8) and at level of fMCu, relative length of R, M and stem of fMCu about 15.5:13.5:26, Rs about 1.6 times of R<sub>1</sub> (8:5), second radial cell not squarely ending, but subtriangular, as long as r-m (3:3.5), about two-thirds of its stem vein (3:4.5), with apical part and inner space colorless, M<sub>3+4</sub> little longer than twice of Cu<sub>1</sub> (15:6.7). Haltere with stem brownish yellow and knob yellowish white.

Abdomen with tergites fuscous brown, sternites and pleural membranes pale brown. Hypopygium largely yellowish brown; sternite 9 transverse, about one-third as long as total length of hypopygium, darker on caudal marginal area and with distinct blunt median caudal process; tergite 9 with anal points small and cerci atrophied; coxites somewhat

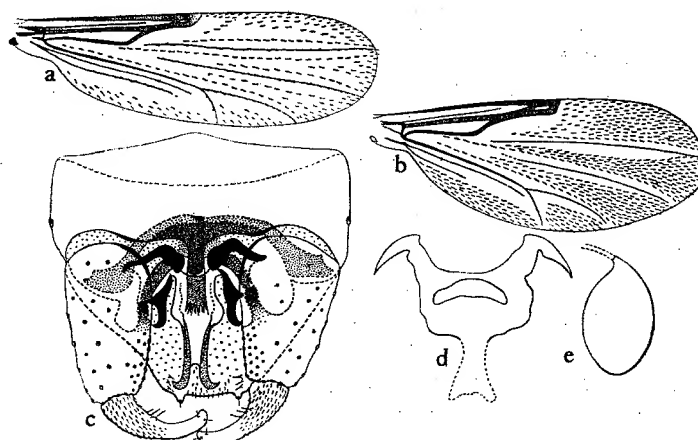


FIGURE 55.—*Dasyhelea pallivittae*: a, wing, male; b, wing, female; c, hypopygium, male; d, subgenital plate; e, spermatheca.

conical, about 1.6 times as long as basal width (27:17), rather densely setigerous on mesal sides of apical parts, each with small bare tubercle at middle of dorsal side and strong internal process at base for articulation to aedeagus; styles rather strongly arcuate, not distinctly tapered and pointed apically, much shorter than coxites (21:27). Aedeagus complicated, with large median lobe which extends almost to caudal margin of tergite and armed with pair of slender hook-like structures on lateral sides of its apical two-thirds, another pair of hook-like processes arising from basal sclerites along lateral sides of basal swollen part of median lobe, basal sclerites somewhat rhombic or triangular, with V-shape chitinized rims, connected with each other by short bar at mesal angles and articulated to internal basal processes of coxites at ends of caudal arms of chitinized rims; semichitinized and pectinate structure on basal membranous part of median lobe (it is not clear whether the structure is derived from the aedeagus or sternite 9); parameres almost symmetrical, rather slender, but lateral ends somewhat broadened, median lobe not distinct, but probably present.

**Female:** Body about 1.35 mm. long. Wing about 0.7 mm. by 0.27 mm. Coloration and structures closely as in male with usual sexual differences.

Head with four segments of maxillary palp in proportion of 7:12:6:6. Antenna scape yellow, flagellar segments brown, main segments missing.

Thorax with three bristles and minute setae on median part of scutellum in addition to two lateral bristles; postscutellum pale brown. Legs almost entirely pale yellow, except

for brown knee joints; relative length of segments, except basal two, about 92:77:47:16:14:10:9 in middle, and 83:74:50:19:15:10.5:10 in hind leg; hind TR about 2.63 and hind tibial comb with four apical bristles.

Wing with macrotrichia rather dense. Venation: Costa ending slightly beyond middle of wing (32:57), relative length of R, M, stem of fMCu, and Rs about 16:13:23:10, Rs about 1.5 times of R<sub>1</sub> and distinctly longer than twice of r-m (38:25:17), second radial cell little shorter than half of stem vein (10:22), M<sub>3+4</sub> about twice of Cu<sub>1</sub> (16:8), fMCu just before level of tip of R<sub>1</sub> and its inner angle about 45 degrees. Haltere with stem brown and knob yellow.

Abdomen with tergites fuscous brown, sternites reduced into membranes and very pale as in pleural membranes; cerci very pale; spermatheca oval, brown, with small neck part and about 2+16 by 11 units; subgenital plate with basal ring very broad, petiole part rather long, caudal arms very widely separated at bases and strongly curved.

Holotype, male (US 64604), Mutunlik, Kusaie I., light trap, Jan. 24, 1953, Gressitt. Allotype, female (US), near Airok I., Ailinglapalap A., Marshall Is., Aug. 26, 1946, Townes.

DISTRIBUTION: Caroline Is. (Kusaie), Marshall Is. (Ailinglapalap).

This species is quite specific in the possession of highly complicated and distinctive male hypopygium. The female is somewhat allied to *D. townesi*; however, its general coloration is much paler, and the subgenital plate is highly different being provided with a rather long petiole-like plate.

#### 64. *Dasyhelea vittula* Tokunaga, n. sp. (fig. 56).

Small, yellowish, with four brown scutal vittae and large round spermatheca. Maxillary palp of female with segment 2 fully twice as long as 1. Antenna of female with apical five segments rather distinctly longer than preceding one and slightly sculptured on surface; no distinct terminal stylet. Thorax almost entirely yellowish, scutum with four slender brown vittae, scutellum with three or four median bristles beside two lateral. Legs of female with knee joints dark, TR of fore and hind leg about 2.43 and 2.22 respectively. Wings of female rather elongate, about 2.66 times as long as wide, with macrotrichia rather sparse, first radial cell absent, costa extending to about middle of wing. Female abdomen yellowish, but with tergites 1 to 7 brown and subsquare; one spermatheca, large, round and with long chitinized part of duct; subgenital plate yellow and without chitinized basal ring.

*Female*: Body length about 1.24 (1.12-1.35) mm. Wings about 0.77 (0.69-0.81) mm. by 0.29 (0.26-0.31) mm.

Head with vertex brown, frons and mouthparts yellowish; proboscis about 0.4 as long as head capsule (6.4:16.8); frontal tubercle round; clypeus with nine to 13 setae arranged into two lines; eyes barely separated from or just contiguous above. Maxillary palp yellowish white, with segment 2 about twice of 1 or equal to following two together and with scattered spoon-like hyaline sensillae, four segments in proportion of 6.5:13.8:6.5:7.7. Antenna mainly brown, but basal short segments slightly paler, with distal five segments slightly sculptured on surface and little longer than basal segments; AR about 0.77, from 0.68 to 0.82; relative length of distal eight segments about 9.3:9.5:9.8:11.3:11.5:11.1:10.8:14.3.

Thorax largely yellow, pleural and sternal sides slightly brownish and postscutellum slightly fuscous; scutum with four separated, brown, slender vittae; scutellum with two lateral and three or four median bristles and rarely central minute seta. Legs extensively pale brownish yellow, but knee joints dark, middle parts of femora broadly and obscurely more brownish, sub-basal parts of femora and tibiae, trochanters, and basal four tarsal segments white; tibial comb of hind leg with six or rarely seven apical bristles; TR of fore and hind leg about 2.43 (2.2-2.6) and 2.22 (2.14-2.28) respectively.

Wing rather long-oval, anal lobe almost absent, about 2.7 times as long as wide, with macrotrichia rather sparse and main anterior veins fuscous. Venation: Costa ending at about middle of wing (29:58.3), relative length of R, M, and stem of fMCu about 13.3:11.3:23.8, Rs about 1.76 of R<sub>1</sub> (9.5:4.5), first radial cell absent, second cell about two-thirds as long as its stem (3.7:5.3), fMCu under second radial cell or costal end, M<sub>1+2</sub> about 2.3 times of Cu<sub>1</sub> (17.8:7.8). Haltere with knob white and stem brown.

Abdomen almost entirely yellow, except for brown tergites 1 to 7, tergites subsquare, with paired small oval pale spots on middle parts and several indistinct pale punctures at setal bases, tergite 7 more or less yellowish on lateral parts; pleural membranes without striation and entirely yellow being similar to sternal side; sternites quite reduced; cerci

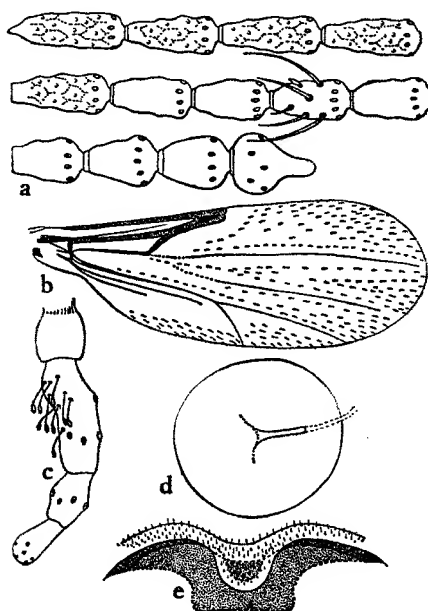


FIGURE 56.—*Dasyhelea vittula*, female: a, flagellar antennal segments; b, wing; c, maxillary palp; d, spermatheca; e, subgenital plate.

and subgenital plate quite yellow. One spermatheca, large, spherical, brown, about 8.2+21.3 by 20 units and with slender chitinized part of duct. Subgenital plate without basal ring and with lateral arms stout and arcuate.

*Male*: Unknown.

Holotype, female (US 64605), Pago, Guam I., Mariana Is., May 27, 1945, sweeping, Gressitt. Paratypes, 15 females with holotype; female (CAS), Alamagan I., Mariana Is., Aug. 28, 1951, Bohart; female (MCZ), Agric. Exper. Sta., Ponape, Aug. 21, 1950, Adams; female (BISHOP), Nanpohnmal, Ponape, Jan. 8, 1953, Gressitt; two females (US), Koror I., Palau Is., May 2, 1957, light trap, Sabrosky.

DISTRIBUTION: Mariana Is., Caroline Is.

This species is allied to *D. subscutellata* and *D. sabroskyi* in coloration, but these three species are distinctly different in the possession of a specific spermatheca and subgenital plate and also the wing venation and development of wing macrotrichia are different.

**65. *Dasyhelea sabroskyi* Tokunaga, n. sp. (fig. 57).**

Small, yellow and dark, with thoracic tergal side mainly yellow, four slender black vittae on scutum and dark-brown abdomen. Maxillary palp very small; distal antennal segments with weak relief on surface, with blunt terminal stylet; apical five flagellar segments of female not distinctly longer than preceding ones, apical four flagellar segments of male subequal in length to each other. Thorax with dorsal side largely yellowish,

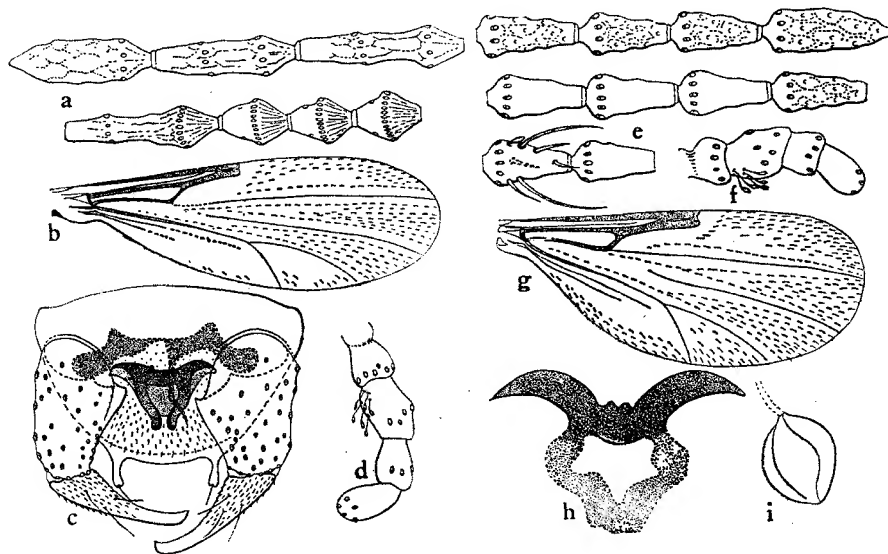


FIGURE 57.—*Dasyhelea sabroskyi*. a-d, male; a, apical seven flagellar antennal segments; b, wing; c, hypopygium; d, maxillary palp. e-i, female: e, apical ten flagellar antennal segments; f, maxillary palp; g, wing; h, subgenital plate; i, spermatheca.

pleural and sternal sides uniformly brown, scutum with four slender vittae, scutellum with three median and minute central setae in addition to two lateral bristles. Legs with coxae brown and other segments largely very pale; TR about 2.26 in fore and 2.22 in hind leg. Wing with anal lobe very obtuse, almost absent, macrotrichia sparsely spread, costa ending about at middle of wing, and without first radial cell. Male hypopygium short, with clavate anal points; aedeagus with lateral sides highly thickened, slightly produced, and bluntly ended at apices; parameres asymmetrical, basal arms broad, and with caudal lobe slender, simple and sharply pointed. Female with single spermatheca, round and without chitinized duct, subgenital plate with basal ring large and cordiform and arms broad and short; sternal plate complete and subsquare.

*Male*: Body length about 1.02 (0.98-1.09) mm. Wing about 0.69 (0.69-0.7) mm. by 0.21 mm.

Head mainly brown, with mouthparts very pale or yellowish, eyes separated above by linear space, frontal tubercle small and oval; clypeus with eight to ten setae; proboscis

about one-third as long as length of head capsule (5.7:17.2). Maxillary palp small, with few spoon-like sensillae on segment 2 and four segments in proportion of 5:7.3:4.7:6.3. Antenna with scape and distal four segments brown, other intermediate short segments yellowish or very pale brown, including plumose hairs; relative length of basal short flagellar segments 2 to 10 and distal four 11 to 14 together about 77:66.7, those of distal eight segments about 7.8:7.8:7.8:7.7:15.5:18.5:15.7:15.8.

Thorax with four distinct brown vittae on yellow scutum, scutellum yellowish white and with three large median and two lateral bristles and central minute seta, postscutellum pale brown or slightly fuscous yellow, pleural and sternal sclerites brown. Legs with coxae brown or fuscous brown, femora little paler and other segments uniformly very pale; TR about 2.26 in fore and 2.22 in hind leg; hind tibial comb with six or seven apical bristles; leg segments, except for basal two, about 68.3:63.3:31:13.7:11.7:9.7:9.3 in fore, 80.7:72.8:36.7:15:12.3:9.3:9.3 in middle, and 73.3:68.3:44:19.3:15.7:11.3:9.7 in hind leg in proportion.

Wing with anal lobe almost absent, entirely pale, with macrotrichia very sparse, several in cell  $M_4$  and few in anal cell. Venation: Costa just beyond middle of wing (28.3:53.3), relative length of R, M, and stem of fMCu about 14:12.3:24, Rs about 1.5 times as long as  $R_1$  (8.3:5.3), second radial cell subsquare, but inner space slit-like, and about half as long as its stem (2.7:4.7),  $M_{3+4}$  about twice as long as  $Cu_1$  (14:6.5), fMCu under tip of Rs. Haltere with stem brown and knob white.

Abdomen entirely dark brown, sternites 3 to 5 separated into paired hemisternites, but 6 to 8 complete and subsquare. Hypopygium short, with sternite 9 transverse and quite bare, tergite 9 semicircular and with paired anal point clavate; coxites conical, rather short and not extending beyond anal points, styles as long as coxites (18:18.7), slightly arcuate and tapered; aedeagus small, with thickened lateral sides little curved and round at tips and pair of minute black tubercles on basal bar; parameres asymmetrical, rather broad, and with very slender and sharply pointed caudal lobe not extending beyond tip of aedeagus.

*Female*: Body about 1.09 mm. long. Wing about 0.62 mm. by 0.28 mm. General coloration as in male or more distinctly marked by dark or dark-brown and yellow coloration.

Head with frontal tubercle rather large and oval. Maxillary palp with four segments in proportion of 5:7:5:6.5. Antenna with apical five segments not suddenly more elongate than preceding segments, sculpture of these apical segments not very distinct, AR about 0.74 and relative length of distal eight segments about 11:11:11:11:11.5:11:11:15.

Thorax with more distinct vittae on scutum than in male. Relative length of leg segments, except for basal two, about 63:60:31:13:11:9:9 in fore, 76:72:35.5:15:12:8:8 in middle, and 72:67:43:19:15:11:10 in hind leg, TR about 2.38 in fore and 2.26 in hind leg.

Wing short-oval, with anal lobe almost absent, with veins fuscous. Venation: Costa extending little beyond middle of wing (25.5:47.5), relative length of R, M, and stem of fMCu about 13:11.5:22, Rs about 1.5 times as long as  $R_1$  (10:6.5), second radial cell about half as long as stem of the cell (3.5:6), fMCu under tip of  $R_1$ ,  $M_{3+4}$  about twice of  $Cu_1$  (16:8).

Abdomen almost entirely dark brown, with sternites complete, pleural membranes darker than tergites, cerci brown; one spermatheca, round, brown, about 12 by 10.5 units and without chitinized part of duct; subgenital plate with basal ring cordiform, but only slightly chitinized, lateral arms stout and rather widely separated at bases. All other main structures as in male.

Holotype, male (US 64606), Ngiwal, Babelthuap I., Palau Is., May 20, 1957, Sabrosky. Allotype, female (US), Koror, Palau I., May 2, 1957, Sabrosky. Paratypes, male with holotype; male, Ngaremlengui, Babelthuap I., Palau Is., light trap, July 1, 1957, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau).

This species is somewhat allied to *D. subscutellata* Tokunaga; however, the genital organs are highly different from each other, the wing of the new species is not provided with an anal lobe, and the macrotrichia are far sparser in both sexes than in the allied species.

**66. *Dasyhelea furcillifera* Tokunaga, n. sp. (fig. 58).**

Rather small, with three broad, dark-brown vittae on scutum, yellow scutellum, brown abdomen, pale punctures on tergites, pale-yellow legs. Antenna without terminal stylet; apical four flagellar segments of male and six of female with reticular surface relief; female flagellar segments very gradually elongate distally and without abrupt change between segments 9 and 10. Scutellum with three central and two lateral bristles.

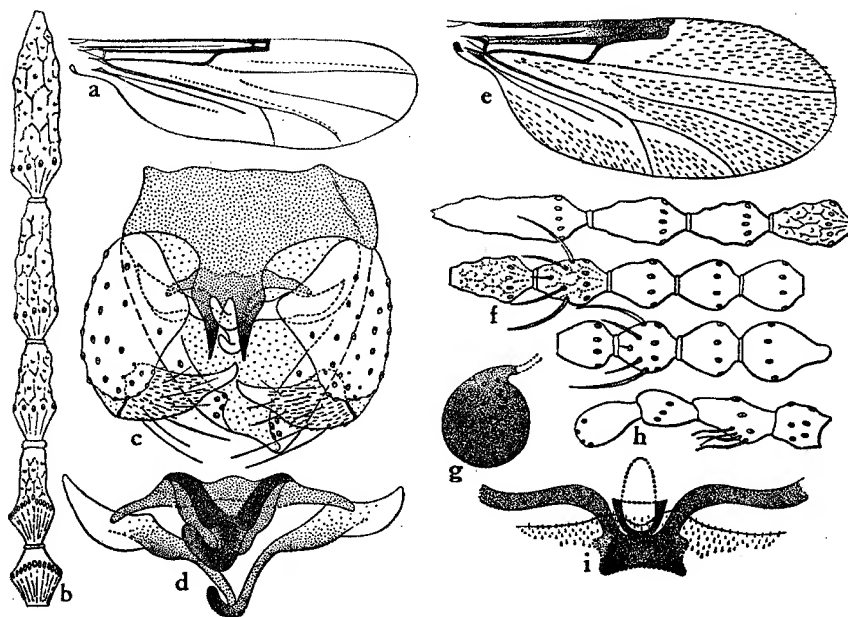


FIGURE 58.—*Dasyhelea furcillifera*. a-d, male: a, wing; b, apical five flagellar antennal segments; c, hypopygium; d, aedeagus and parameres. e-i, female: e, wing; f, flagellar antennal segments; g, spermatheca; h, maxillary palp; i, subgenital plate.

Wing with costa ending about at (in male), and slightly beyond (in female), middle of wing, first radial cell absent, male wing with macrotrichia sparse. Abdominal sternites 3 to 5 separated into paired hemisternites; male hypopygium with symmetrical parameres, short and cuneiform styles and two-forked caudal projection of sternite 9 and without distinct anal points; spermatheca single, round, and with hyaline punctures and subgenital plate with subsquare basal plate, U-shape small sclerite between lateral arms almost uniform in width.

*Male:* Body about 1.63 mm. long. Wing about 1.03 mm. by 0.31 mm. General coloration dark brown or brown and yellow.

Head with vertex brown, frons yellowish brown, mouthparts yellow; eyes very narrowly separated above by a linear space; frontal tubercle oval, clypeus with six setae;

proboscis short, much shorter than height of head capsule (9:23). Maxillary palp yellow, short, with few hair-like sensillae on ventral side and four segments in proportion of 7:14:7:9. Antenna with scape and distal three segments brown, other segments and plumose hairs yellowish, distal four segments with reticular relief on surface, relative length of segments 2 to 10 and 11 to 14 together about 105:89 and those of distal eight about 11:10.5:10:9.5:17:17:23:30.

Thorax mainly dark brown, but scutum with three brown broad vittae and yellowish stripes and spots; median vitta not subdivided and extending onto caudoscuteal area, lateral vittae broadened on anterior parts laterally, humeral margin, semicircular lateral parts including scutal sutures, linear spaces on foveae and lateral parts of caudoscuteal area yellow; scutellum yellow, with two lateral and three median bristles. Legs entirely pale yellow; hind tibial comb with three or four apical bristles; hind TR about 2.83 and fore about 3.3; leg segments, except basal two, about 106:102:66:20:15:7:15 in fore, 132:117:82:24:17:11:16 in middle, and 124:109:82:29:20:13:16 in hind leg.

Wing very pale, with macrotrichia very sparsely spread on marginal areas of cells  $R_1$ ,  $M_1$ , and  $M_2$  and absent in cell  $M_4$  and anal cell. Venation: Costa ending at middle of wing (36.5:79), relative length of R, M, and stem of fMCu about 25:22:37.  $R_s$  little longer than  $R_1$  (13:10), first radial cell absent, second cell subsquare and about one-third as long as its stem (3:8), fMCu under second radial cell,  $M_{3+4}$  about twice as long as  $Cu_1$  (20:9). Haltere with stem pale brown and knob yellow.

Abdomen almost entirely brown, tergites with many pale punctures at bases of setae and those of anterior part each with small incision on either lateral part of anterior margin; sternites of segments 3 to 5 separated into paired hemisternites, that of 6 atrophied on central part, 7 and 8 complete. Hypopygium: Sternite 9 produced caudad into large bifid projection extending as far as tip of aedeagus; tergite 9 with caudal margin subsquare, extending beyond tips of coxites and without anal points; coxites conical and styles short, stout, cuneiform, about 0.8 as long as coxites (24:30); aedeagus with basal bar rather long and almost straight, median triangular lobe thickened on lateral sides and with median caudal elongation which curves ventrad, extending between two lobes of sternite; parameres symmetrical, with basal arms tapered, extending caudad and convergent with each other and forming small median lobe which curves ventrad as caudal lobe of aedeagus.

*Female:* Body length about 1.73 mm. Wing about 0.88 (0.83-0.92) mm. by 0.3 mm. Coloration and structures mainly similar to those of male, with usual sexual differences.

Head with proboscis about 0.4 as long as head capsule (6.6:16.5); clypeus with 4 to 8 setae. Maxillary palp with four segments in proportion of 6.7:12.7:6.7:9, segment 3 with several scattered sensory hairs. Antenna with basal flagellar segments subspherical and very gradually elongate distally, no abrupt elongation between segments 9 and 10, segment 9 with weak reticular surface relief, following five with distinct relief; AR about 0.97 (0.92-1.05); relative length of distal eight segments about 8.8:9.2:4:11.8:12.4:12.5:14.8:23.3; no distinct terminal stylet.

Thorax with more distinct yellow and brown spots on dorsal side than in male. Legs with fore and hind TR about 3.51 and 3.13 respectively, segments, except basal two, about 86:80.3:52.7:15:12.3:10.3:12.3 in fore, 107.3:96.2:63.2:18:13.3:9.8:12.2 in middle, and 101.7:90.7:68.3:21.5:15.4:10.7:12.5 in hind leg; hind tibial comb with three or four apical setae.

Wing with veins pale brown, macrotrichia not thickly spread, costal and radial cells somewhat fuscous. Venation: Costa ending little beyond middle of wing (39.3:67.5), relative length of R, M, and stem of fMCu about 19.8:17.8:28.5,  $R_s$  about 1.5 times as long as  $R_1$  (12.9:8.4), second radial cell shorter than half of its stem (3.6:8.5),  $M_{3+4}$  about twice of  $Cu_1$  (21:11.2), fMCu under tip of stem vein of second radial cell.

Abdomen mainly brown, sternal membranes yellowish, pleural membranes slightly fuscous brown; cerci and last segment yellow; single spermatheca, brown, with pale punctures, round (12.3 by 11.8 units), with curved yellowish neck part of duct; subgenital plate with subsquare basal plate, U-shape small sclerite between lateral arms, which are rather slender.



Holotype, male (US 64607), Rumung I., Yap Is., June 17, 1957, Sabrosky. Allotype, female (US), with holotype. Paratypes, Palau: Female (BISHOP), Ngaiangl A., Dec. 15, 1952, Gressitt; female (US), Ngiwal, Babelthuap I., May 21, 1957, Sabrosky; 24 females, Ngaremlengui, Babelthuap I., light trap, June 1, 3, 1957, Sabrosky; female, Melekeiok, Babelthuap I., May 22, 1957, Sabrosky; 17 females and males, Ngarbaged, Koror I., May 17, 1957, Sabrosky; three females, Koror I., May 2, 30, July 24, 1957, Sabrosky; six females, male, Ngerkabesang I., May 7, 1957, Sabrosky. Yap: Two females, Gagil District, Yap I., June 19, 1957, Sabrosky; 79 females and males, Rumung I., light trap, June 17, 1957, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau, Yap).

This is allied to *D. raripilosa* Tokunaga and the female is somewhat allied to *D. palauensis* Tokunaga. Although these three species are very closely similar in coloration to each other, the genital organs of both sexes are quite specific for each species and clearly different from each other.

**67. *Dasyhelea palauensis* Tokunaga (fig. 59, a-c).**

*Dasyhelea palauensis* Tokunaga, 1940, *Tenthredo* 3 (2): 177 (Palau).

Small, shiny; scutum almost uniformly dark brown or with brown stripes in yellow ground color; scutellum yellow and with two lateral and three or four median bristles and in male with accessory median seta; antenna without terminal stylet; abdominal tergites uniformly brown and without bands.

*Male*: Body length about 1.34 (1.3-1.39) mm. Wing 0.75 (0.73-0.78) mm. by 0.26 (0.25-0.27) mm.

Head dark brown, with frons brown, mouthparts brown or pale brown; clypeus with eight to 11 setae. Maxillary palp very pale brown or pale yellow, with five segments in proportion of 4:6:15.5:6:9. Antenna with scape dark brown, flagellum and plumose hairs brown, last segment without terminal stylet; segments 2 to 10 and 11 to 14 in proportion of 85.6:70.1; proportion of eight distal segments about 8.6:8.6:8.8:9.5:16.4:18:16.1:17.7.

Thorax, in striped form, with three brown vittae on scutum, median vitta subdivided by slender yellow stripe along mid-dorsal line, caudoscuteal area pale brown and with pair of suboval yellow spots connected by pair of slender yellow stripes along foveae with yellow humeral spots, lateral parts of posterior half yellow. In dark form, scutum uniformly dark brown except for obscurely paler humeral parts; scutellum yellow, but slightly brownish at lateral sides, with pair of lateral and three median bristles and accessory median seta; other thoracic sclerites all brown. Legs with coxae all brown, other segments almost uniformly pale brown, but in dark form all femora somewhat broadly brownish on middle parts, and hind tibia also brownish on apical two-thirds; leg segments, except for basal two, in proportion of 76.5:76:38.5:16.2:14.5:13:12.3 in fore leg, 90.3:88.4:43:18:15.4:12.1:11.3 in middle leg, and 82.5:79.8:47.3:21:18:12.8:11.8 in hind leg.

Wing with macrotrichia very sparsely arranged on apical part of wing membrane, cell  $M_4$  with less than ten trichia and anal cell without trichia, costal and radial veins pale brown. Venation: Costa ending at middle of wing (29.5:58),  $R_s$  shorter than half of  $R$ , about 1.5 times as long as  $R_1$  (7.1:16.6:4.6), first radial cell absent, second radial cell distinctly shorter than stem (11:13.8), somewhat square, incomplete, connection between  $R_s$  and costa being incomplete,  $R_1$  sometimes atrophied at tip, fMCu just under or slightly beyond tip of costa. Haltere with stem brown and knob white.

Abdomen with dorsal side uniformly brown or fuscous and without paler bands or

punctures at setal bases, ventral and lateral sides fuscous. Hypopygium: Sternite 9 produced caudad under aedeagus between coxites and shorter than wide (53:75), its median projection almost hyaline, round, and with blunt round shoulders; tergite 9 somewhat trapezoid, tapered caudad, truncate at tip, and with pair of minute anal points. Coxite rather slender, about twice as long as wide (30.3:14.8); style about 0.7 as long as coxite (23.8:30.3), distinctly tapered, slightly undulate, apex very slightly curved inward and somewhat pointed. Aedeagus very short, transverse, basal arch-like bridge strongly chitinated, more or less bowed, and with pair of hook-like lateral processes, arising from lateral parts of basal arch, curved laterad, and often hidden under basal arch in ventral aspect. Parameres with broad median lobe and symmetrical, rather slender, basal arms, median lobe about twice as long as median width (24:11) and about as long as style, basal part pointed and apical part bifurcate into subequal short lobes more or less curved toward each other, forming an oval space between them, basal arms very slender at tips, irregularly expanded on lateral parts, and ending at dorsal sides of bases of coxites.

*Female*: Body length 1.47 mm. Wing about 0.89 mm. by 0.33 mm. Coloration generally similar to that of striped form of male.

Head with vertex dark brown, frons and labrum yellowish brown, eyes just contiguous above or very narrowly separated, frontal tubercle somewhat rhombic or fusiform; clypeus with seven to nine setae; proboscis little longer than half of vertical length of head capsule. Maxillary palp pale brownish yellow, with five segments in proportion of 3.4:8.2:16.2:8:10.1; segment 3 rather slender, last segment oval. Antenna with papilliform terminal tip or blunt; basal short segments oval and shorter than twice of basal width; distal segments 10 to 13 rather long-oval or bottle-like and hardly twice as long as basal width; last segment elongate and oval; AR about 0.78 (0.75-0.84, 71.2:90.3); distal eight segments in proportion of 11.7:11.3:11.3:12.9:13.6:13.8:13.8:17.6.

Thorax: Scutum yellow with distinct median and paired lateral brown vittae and small brown spot on each side; in some cases caudoscuteal area and humeral parts extensively brownish; scutellum yellow, with four, or in some cases three, large median bristles and without small accessory median setae; postscutellum brown; pleural and sternal sclerites pale brown. Legs with coxae brown as thoracic pleural color, all articulations brown, other segments mainly yellowish pale brown, but last tarsal segments more brownish, fore femur with broad obscure brown cloud at middle part and hind femur with a similar cloud on preapical part; leg segments, except for coxae and trochanters, in proportion of 85.4:88.6:46:20.9:18.5:13.6:13.6 in fore leg, 107.1:109.3:58.3:23.3:18.4:13.7:13.5 in middle leg, and 103.7:95.1:59.4:24.7:20.1:13.6:13.2 in hind leg.

Wing with macrotrichia rather sparse, cell  $M_4$  with about 25 (20-36) trichia and anal cell with trichia on caudal half on marginal area, bare areas along veins rather broad and distinct; costal and radial veins pale brown or brown. Venation: Costa ending slightly beyond middle of wing (38.1:68.4),  $R_s$  shorter than  $R$  and about 1.52 times as long as  $R_1$  (13.8:18:9.1), first radial cell absent, second cell small, rhombic or subsquare, brownish and shorter than half of stem (15.8:35), stem of  $fMCu$  about 1.63 times as long as  $R$  (29.3:18),  $fMCu$  usually at level of tip of  $R_1$  or rarely slightly before tip of  $R_1$ ,  $Cu_1$  ending at level of costal end or slightly before it. Haltere with stem brown and knob yellow or pale yellow.

Abdomen with tergites brown, intersegmental bands pale and distinct, sternites highly reduced, pleural and sternal membranes very pale brownish hyaline, segment 9 pale brown including cerci; segment 8 with brown narrow ridge at anterior margin; subgenital plate very pale brown, with somewhat V-shape and very widely divergent caudal arms and very much obscure basal ring; spermatheca brown, oval, about 15.6 by 10.2 units, and with chitinated duct very short and curved.

DISTRIBUTION: Mariana Is., Caroline Is., Marshall Is., Gilbert Is.

S. MARIANA IS. SAIPAN: As Mahetog section, female, May 1945, Dybas; Afenia Pt., three females, June 1946, Townes. TINIAN: Southeast part, female, Mar. 1945, Dybas. GUAM: Yigo, two females, Oct. 1957, Krauss.

PALAU. BABELTHUAP: Ngarabau, two females, May 1957, Sabrosky; Ngerehelong Pen., three females, May 1957, Sabrosky; Ngaremlengui, four females, three males, June 1957, Sabrosky; East Ngatpang, 65 m., female, light trap, Dec. 1952, Gressitt; Imeliik, female, June 1957, Sabrosky. KOROR: Female, Nov. 1947, Dybas; female, male, at light, Apr. 1953, Beardsley; ten females, five males, light trap, Apr.-May 1957, female, light trap, June 1957, female, eight males, light trap, July 1957, Sabrosky; southwest part, two females, light trap, Dec. 1952, Gressitt. PELELIU: Four females, four males, Aug. 1945, Dybas; east coast, male, beating, Aug. 1945, Dybas; north central part, many males, Aug. 1945, Dybas; Mt. Amiangal, male, Dec. 1952, Gressitt. ANGAUR: Eight females, male, Feb. 1947, Dybas.

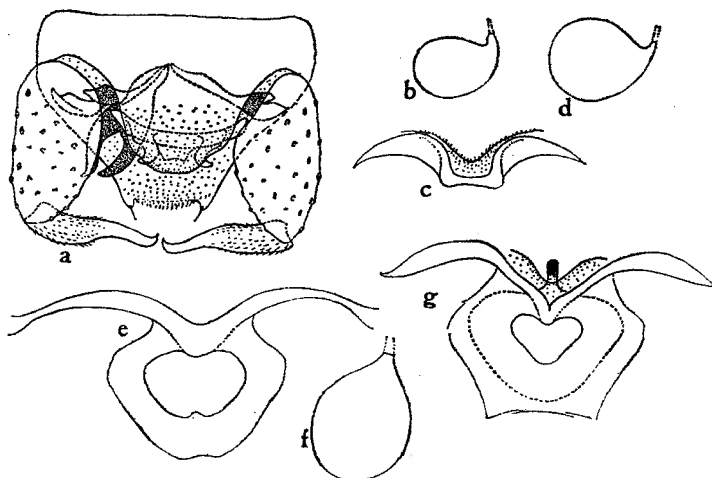


FIGURE 59.—a-c, *Dasyhelea palauensis*: a, hypopygium, male; b, spermatheca; c, subgenital plate. d, e, *D. sp. No. 5*: d, spermatheca; e, subgenital plate. f, g, *D. sp. No. 6*: f, spermatheca; g, subgenital plate.

YAP. YAP: Male, July 1950, Goss; Kanif, male, July 1950, Goss.

TRUK. FEFAN: Female, May 1946, Townes.

PONAPE. Colonia, female, June-Sept. 1950, Adams; Mt. Temwetemwen-sekir, 180 m., male, Jan. 1953, Gressitt.

MARSHALL IS. KWAJALEIN: Six females, Nov. 1956, Clagg.

GILBERT IS. TARAWA: Bairiki I., two females, Nov. 1957, Krauss; Betio I., two females, Nov. 1957, Krauss.

OCEAN I. Five females, Dec. 1957, Krauss.

#### 68. *Dasyhelea sp. No. 4.*

Rather small; intermediate antennal segments all short and oval, scutum with distinct brown vittae, scutellum yellow and with two large median bristles, wing with about 20 macrotrichia on membrane of anal cell in line separated from anal margin as in *D. vari-*

*pilosa*, vein  $Cu_1$  strongly curved, ending at anal margin with about 90-degree angle, abdominal sternites, except for basal two, subsquare, spermatheca subspherical and without punctures and dots.

*Female*: Body length about 1.25 mm. Wing about 0.7 mm. by 0.3 mm.

Head: Clypeus with about nine setae. Maxillary palp with five segments in proportion of ? : 5.5 : 12 : 6.5 : 7. Antenna with scape deep brown, flagellar segments short oval, and distal five segments not distinctly different from preceding ones.

Thorax with three brown vittae of scutum on yellow ground color, median vitta not reaching caudoscuteal area; two short, lateral vittae and caudal half of caudoscuteal area brown; scutellum yellow, with two large lateral and two large median bristles, and without small accessory setae; other sclerites all brown. Legs with coxae, femora, and last tarsal segments brown, trochanters and tibiae pale brown, basal four tarsal segments pale yellow; proportion of leg segments, except for basal two, about 71.5 : 70 : 38 : 15.5 : 13.5 : 11.5 : 10 in fore leg, 89.5 : 85 : 49 : 16 : 14.5 : 11 : 11 in middle leg, and 84 : 76 : 59 : 20 : 17 : 12 : 10 in hind leg.

Wing with macrotrichia rather dense on apical part of cells  $R_5$ ,  $M_1$ , and  $M_2$  and very sparse in cell  $M_4$  and anal cell, the former with about seven trichia and the latter with about 20 trichia in line separated from anal margin; costal and radial veins and second radial cell brown. Venation: Costa ending far beyond middle of wing (31 : 54),  $R_s$  about 0.73 as long as  $R$  and about 1.57 times as long as  $R_1$  (11 : 15 : 7), first radial cell absent, second cell short and about half as long as stem (13 : 27), stem of fMCu about 1.57 times as long as  $R$  (23.5 : 15), fMCu under tip of  $R_1$ ,  $Cu_1$  strongly curved, ending at anal margin with about 90-degree angle at level of middle of second radial cell. Haltere with knob yellow.

Abdomen with tergites brown, first two sternites highly reduced, and following sternites brown and subsquare, pleural membranes brown, segment 9, including cerci, pale brown; pale tergal punctures at bases of setae indistinct; spermatheca round, 13 units and 12 units, and without dots or puncture.

*Male*: Unknown.

#### DISTRIBUTION: Mariana Is.

S. MARIANA IS. SAIPAN: Afenia Point, female, June 1946, Townes.

This species is somewhat allied to *D. raripilosa*, but in *raripilosa*, the scutum has a pair of additional small brown spots on the yellow shoulder parts, the scutellum has three large median bristles,  $Cu_1$  extends and meets the anal margin obliquely, and the spermatheca is dotted with many pale punctures; while in this species, the scutum does not have humeral brown spots, the scutellum has only two large median bristles,  $Cu_1$  extends caudad and meets the anal margin at a 90-degree angle, and the spermatheca does not have pale punctures.

#### 69. *Dasyhelea* sp. No. 5 (fig. 59, d, e).

Medium-size; scutum with three long brown vittae and pair of additional short brown vittae on lateral part; scutellum with five large median bristles and two small accessory setae; antennal flagellar segments oval and last segment round at tip; abdominal sternites of segments 3, 4, and 5 reduced to paired hemisternites and following sternites subsquare; spermatheca subspherical and subgenital plate with large, cordiform basal ring, caudal arms arcuate and shallow, V-shape caudal concavity between two arms.

*Female*: Body length about 1.37 mm. Wing 0.75 mm. by 0.27 mm. General coloration and structure somewhat similar to those of *D. townesi*.

Head almost entirely brown, with frontal tubercle subrhombic but dorsal margin round; clypeus with about 11 setae. Maxillary palp pale brown, with five segments in

proportion of 3:6:15:8:8.5. Antenna brown, with flagellar segments oval, segments 10 to 14 longer than preceding ones, last segment rather broad, oval, round at tip, and without terminal stylet; AR about 0.82 (56:68); distal eight segments in proportion of 9:9:8.5:10:10.5:10.5:11:14.5.

Thorax with brown vittae on scutum which are somewhat more obscure than in *D. townesi*; shoulder parts, lateral parts above wing bases, and caudoscuteal area pale yellowish brown; scutellum yellow, with two large lateral and five large median bristles and two small accessory setae; other sclerites brown. Legs with coxae and femora brown, but somewhat paler than thoracic pleural sclerites; trochanters, tibiae, and last tarsal segments pale brown; basal four tarsal segments pale brownish hyaline; leg segments, except for basal two, in proportion of 80:79:31:17.5:15:11.5:10 in fore leg, 95:92:46:18:16:12:11 in middle leg, and 90:84:59:23:19:12.5:12 in hind leg.

Wing with macrotrichia rather sparse, cell  $M_4$  with about 16 trichia, and anal cell with many trichia on membrane of caudal half, costal and radial veins pale brown. Venation: Costa ending beyond middle of wing (32.5:57),  $R_s$  about 0.7 as long as  $R$  and about 1.7 times as long as  $R_1$  (11:15.5:6.5), first radial cell absent, second cell rather large, about 0.74 as long as stem (17:23) with square end and oval inner space, stem of fMCu about 1.45 times as long as  $R$  (22.5:15.5), fMCu under tip of  $R_1$  and  $Cu_1$  ending under costal end. Haltere with stem brown and knob pale brown.

Abdomen with tergites brown, sternites 1 and 2 highly reduced, following three sternites reduced to paired hemisternites, following caudal sternites subsquare and brown, pleural membranes pale brownish fuscous, sternal membranes pale yellow; intersegmental bands and pale punctures at bases of setae absent; cerci brown; spermatheca brown, subspherical, 21 by 19 units, and with small chitinated duct. Subgenital plate with large subcordiform basal ring, caudal arms rather slender, arcuate, and very widely divergent, forming a very shallow concavity between arms.

*Male*: Unknown.

DISTRIBUTION: Mariana Is., Caroline Is.

S. MARIANA IS. ROTA: Rota I., female, June 1946, Townes.

PALAU. BABELTHUAP: Koror, female, Nov. 1947, Dybas.

This species is very closely allied to *D. townesi*, but the scutellum is more setigerous, being provided with five large median bristles and two small accessory setae, all tibiae are very pale brownish hyaline, the abdominal tergites are not provided with pale punctures at bases of setae, and the spermatheca is subspherical and about 22 by 19 units. In *D. townesi*, the scutellum is less setigerous, being provided with only three large median bristles and without small accessory setae, the tibiae are somewhat more brownish than basal tarsal segments, the abdominal tergites are provided with somewhat indistinct pale punctures at bases of setae, and the spermatheca is suboval and about 18 by 10 units.

#### 70. *Dasyhelea* sp. No. 6 (fig. 59, f, g).

Small; scutum with three long brown vittae and two additional short lateral brown vittae; scutellum with three or four large median bristles and without, or with one or two, small accessory setae; antenna with oval flagellar segments, but distal five segments somewhat longer, ultimate segment rather broad, oval, and with papilliform apical tip; spermatheca short oval; subgenital plate with subcordiform basal ring, caudal arms rather slender, arising from middle part of caudal margin, extending almost straight and widely divergent; caudal concavity between two arms V-shape and with minute, dark-brown isolated sclerite between bases of caudal arms.

*Female*: Body length about 1.25 (1.12-1.47) mm. Wing about 0.67 (0.59-0.72) mm. by 0.29 (0.25-0.3) mm. Coloration and general structure somewhat related to those of *Dasyhelea* sp. No. 7.

Head entirely brown or with frons and mouthparts pale brownish yellow or pale brown; eyes broadly contiguous above, frontal tubercle subrhombic; clypeus with about 11 setae. Maxillary palp very pale brown or pale yellow, rather slender, and with five segments in proportion of 4.1:7.1:15.2:6.1:8.3. Antenna with scape deep brown, flagellar segments brown and almost entirely short oval, or sometimes distal segments 10 to 13 slightly longer; last segment oval and with papilliform apical tip; AR about 0.76 (0.73-0.79, 49.2:65.2), proportion of distal eight segments about 8.2:8.2:8.2:9.1:9.1:8.8:8.7:13.3.

Thorax with three, long brown vittae on scutum, pair of brown clouds or short vittae on middle parts of lateral margin, and broad, pale-brown cloud on caudal half of caudocutal area on yellow ground color; scutellum yellow or pale brownish yellow, with two large lateral and three or four large median bristles and usually one or two small accessory setae, rarely without small setae; other thoracic sclerites all brown. Legs with coxae brown, femora and last tarsal segments usually brown but sometimes paler than coxae; trochanters and tibiae usually somewhat brown but often paler; basal four tarsal segments pale brownish hyaline; leg segments, except for basal two, in proportion of 68.8:66.3:34.6:14.7:12.6:10.3:9.8 in fore leg, 83.3:84.3:40.7:16.1:13.6:10.7:9.8 in middle leg, and 77.2:73.3:44.3:19.1:15.5:11.1:10.9 in hind leg.

Wing short oval with macrotrichia rather dense, cell  $M_4$  with about 38 (21-56) trichia, anal cell with many trichia on caudal half along anal margin, costal and radial veins pale yellow or pale brownish yellow. Venation: Costa ending slightly beyond middle of wing (27.8:51.5),  $R_s$  about 0.73 times as long as  $R$  and about 1.57 times as long as  $R_1$  (9.4:12.8:6), first radial cell absent, second cell about 0.68 as long as stem (14.6:21.5), stem of  $fMCu$  about 1.7 times as long as  $R$  (21.1:12.8),  $fMCu$  and tip of  $Cu_1$  under, or rarely just beyond, tip of  $R_1$  and costal end. Haltere with stem brown and knob pale yellow or yellow.

Abdomen with tergites brown, anterior two sternites highly reduced, following posterior ones brown and subsquare, pleural and sternal membranes brownish fuscous; pale punctures at bases of tergal setae obscure; intersegmental bands yellowish and rather distinct; cerci brown; spermatheca brown, short oval, about 16.4 by 12.4 units, and with minute, yellow chitinized duct; subgenital plate with large and subcordiform basal ring, caudal arms rather slender, almost straight, V-shape, caudal concavity between arms triangular, with minute, isolated brown sclerite between bases of arms.

*Male*: Unknown.

DISTRIBUTION: Mariana Is., Caroline Is.

S. MARIANA IS. ROTA: Female, June 1946, Townes; near Sabana, female, June 1946, Townes.

PALAU. NGAIANGL: Female, light trap, Dec. 1952, Gressitt. KOROR: Female, Jan. 1945, Dybas; two females, Dec. 1947, Dybas; three females, Dec. 1952, Gressitt; eight females, May 1957, Sabrosky; two females, July 1957, Sabrosky; southwest part, 25 m., two females, light trap, Dec. 1952, Gressitt. MALAKAL: Female, May 1957, Sabrosky. PELELIU: North central, five females, Aug. 1945, Dybas; north central, female, at light, sweeping air, July 1945, Dybas. ANGAUR: Female, Feb. 1948, Dybas.

YAP. RUMUNG: Three females, June 1957, Sabrosky. MAP: South Map I., female, Aug. 1950, Goss.

This species is very closely allied to *D. townesi* in general structure and coloration and seems to be allied to *D. insulicola*, but there is not sufficient

proof to identify it with this species. In *townesi*, the following characters are highly different from those of this female: Antennal segments 10 to 13 are oblong and much longer than preceding segments; the ultimate segment has no papilliform stylet; the AR is always larger than 8; the scutellum has no small accessory setae; the spermatheca is elongate, oval, and about 1.8 times as long as wide; and the subgenital plate has widely separated caudal arms and no accessory sclerite between the bases of the caudal arms.

**71. *Dasyhelea carolinensis* Tokunaga (fig. 60, *a*, *b*).**

*Dasyhelea carolinensis* Tokunaga, 1941, Annot. Zool. Japon 20 (2): 112 (Truk).

Rather large, black or dark brown; antenna with terminal stylet; scutellum dark brown, with seven or eight median bristles in a line along caudal margin, and three to 13 small median accessory setae; legs mainly brown or dark brownish; wing with rather dense macrotrichia on membrane, cell  $M_4$  with many trichia, costal and radial veins dark but inner space of second radial cell hyaline, haltere dark brown. Abdomen dark brown; anterior tergites in male with somewhat indistinct hyaline punctures at bases of setae, these punctures absent on posterior tergites, and in female punctures absent. In male, hypopygium with a large, ribbon-like median lobe of parameres. In female, spermatheca large, round, and with curved chitinized duct.

*Male*: Body length about 1.69 mm. Wing about 1.26 mm. by 0.38 mm.

Head dark brown including mouthparts; clypeus with about ten or more setae. Maxillary palp somewhat paler but dark brown, five segments in proportion of 4:7:16:8:10. Antenna entirely dark brown, with terminal stylet, proportion of segments 2 to 10 and 11 to 14 about 129:121, proportion of distal eight segments about 12.5:12.5:13:14:31.5:30:27:41.5.

Thorax entirely dark brown; scutellum dark brown, with two lateral and eight median setae in a line along caudal margin and three small median accessory setae. Legs with coxae, trochanters, femora, tibiae, and last tarsal segments dark brown, basal four tarsal segments pale brown; leg segments, except for basal two, in proportion of 123:117:77:30:20.5:15:15 in fore leg, 135:143:90:33:24:16:15 in middle leg, and 141:127:104:41:28:19:16 in hind leg.

Wing with rather dense macrotrichia on membrane, cell  $M_4$  with about 34 trichia, anal cell also with trichia, costal and radial veins dark, but second radial cell clearly hyaline. Venation: Costa far beyond middle of wing (53:95),  $R_s$  rather long, about 0.6 as long as  $R$  (17:28),  $R_1$  also rather long, a little shorter than 0.8 of  $R_s$  (13:17), first radial cell absent, second cell somewhat rhombic and hardly 0.4 as long as stem (18:47), relative length of  $R$  and stem of fMCu about 28:41, fMCu a little before tip of  $R_1$  and tip of  $Cu_1$  a little beyond costal end. Haltere entirely dark brown.

Abdomen with dark-brown tergites, sternites reduced, lateral and sternal membranes pale dark brown, anterior tergites with somewhat indistinct hyaline punctures at bases of setae, but posterior tergites without these punctures. Hypopygium with sternite 9 transverse, about three times as broad as long, without caudal projection, median caudal margin almost straight; tergite 9 hardly as long as wide, broadest at level of bases of coxites, tapered, broadly truncate at caudal tip, with rather slender distinct anal points. Coxite rather stout, oval in ventral aspect, about 1.4 times as long as wide; style fully as long as coxite (36:35), slightly arcuate and tapered, ending in two minute tips. Aedeagus rather small, triangular, basal arch very low, with caudal sclerites not completely separated into two pairs and each with minute concavity on apical part; parameres with ribbon-like, long median lobe, far longer than coxites (48:35), and curved apical one-third, lateral basal arms asymmetrical and rather broad, sinistral arm strongly curved, dextral arm less curved and longer, both arms broader on lateral half than on mesal half.

*Female*: Body about 1.94 mm. Wing about 1.39 mm. by 0.44 mm. Coloration generally as in male.

Head with proboscis rather short and far shorter than half of vertical length of head (12:30), eyes very narrowly separated above; clypeus with ten to 12 setae. Maxillary palp brown, with five segments in proportion of 3.5:6.3:17:9:10.3. Antenna with scape black to dark brown, flagellar segments brown; basal flagellar segments 3 to 9 sub-spherical to short oval, segments 10 to 13 bottle-shape, distinctly longer than preceding ones, and with short neck part, last segment long, almost as long as twice of penultimate, and with slender terminal stylet; AR about 0.85 (102:119.5); distal eight segments in proportion of 15:14.5:15.5:17.5:17.5:17.3:17.8:33.

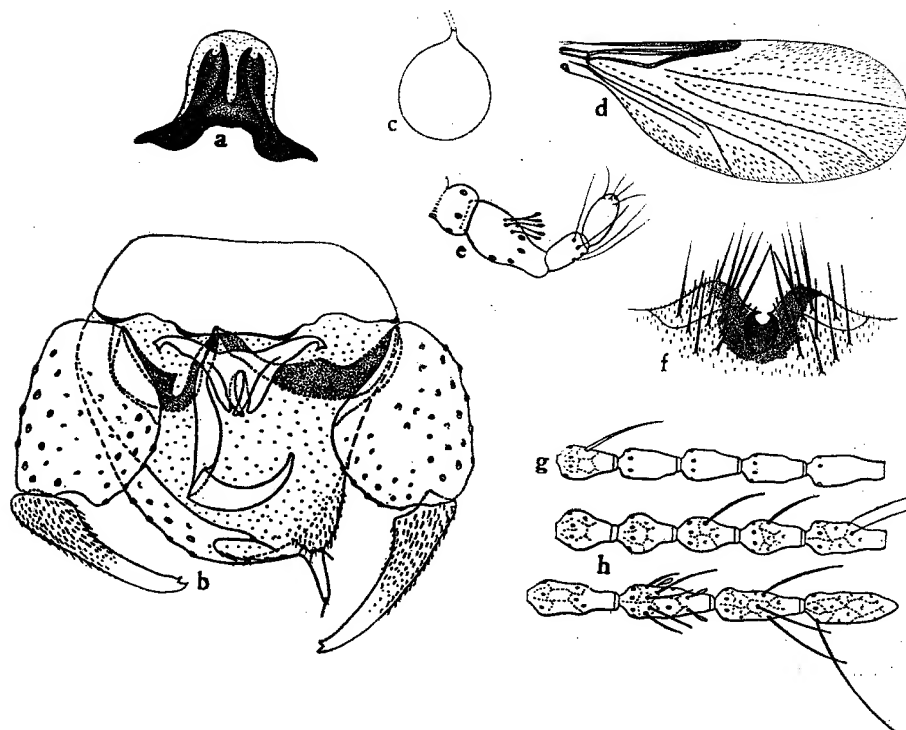


FIGURE 60.—a, b, *Dasyhelea carolinensis*, male: a, aedeagus; b, hypopygium. c-h, *D.* sp. No. 7, female: c, spermatheca; d, wing; e, maxillary palp; f, subgenital plate; g, antennal segment 6 to 10; h, apical nine antennal segments of another specimen.

Thorax entirely dark brown to deep brown; scutellum with nine or ten large bristles arranged in line along caudal margin, including two lateral bristles and six to 13 small accessory setae on anterior area. Legs with coxae, trochanters, femora, tibiae, and last tarsal segments brown, knee joints dark brown, basal four tarsal segments very pale brown, both ends of femora and tibiae more or less paler and fore femur distinctly paler; proportion of leg segments, except for basal two, about 120:114:76:28:20.8:15.5:16 in fore leg, 140.5:136:83.5:29.5:21.5:16.5:18.5 in middle leg, and 143:132.5:103:40:26.5:18:19 in hind leg.

Wing with rather dense macrotrichia, bare areas along veins somewhat indistinct, costal and radial veins brown, distal part of costal and second radial cell brownish.



Venation: Costa ending far beyond middle of wing (53:89), Rs very long, as long as R and about 1.4 times as long as  $R_1$  (22:22:15.8), first radial cell absent, second cell somewhat rhombic, far shorter than half of stem (27.5:59), and inner space suboval, stem of fMCu about 1.5 times as long as R (33.3:22), fMCu under or just beyond midway of Rs,  $Cu_1$  ending just before costal end. Haltere with stem brown, knob entirely brown or basal one-third yellowish.

Abdomen with tergites brown, ventral side pale brown, pleural membranes slightly paler than tergites; sternites of segments 3 and 4 divided into paired hemisternites and those of following segments complete and subsquare, all sternites strongly setigerous; cerci brown; subgenital plate without basal ring, but with spatula-like plate before V-shape lateral arms as in *D. perfida* and *subperfida*; spermatheca brown, round, about 19.5 by 24.8 units and with small, yellow, sclerotized duct.

#### DISTRIBUTION: Caroline Is.

Allotype, female, at light, Apr. 1949, Potts.

PALAU. BABELTHUAP: Ngaremlengui, female, June 1957, Sabrosky.

KOROR: Female, Aug. 1957, Sabrosky.

TRUK. WENA: Female, male, June 1946, Townes; male, 180 m., July 1946, Townes. TON: Female, same data as for allotype.

PONAPE. Agric. Exper. Sta., Colonia, male, July-Sept. 1950, Adams; Nanpohnmal, female, Jan. 1953, Gressitt.

#### 72. *Dasyhelea* sp. No. 7 (fig. 60, c-h).

Small, yellow and brown, scutum with four long and a pair of short brown vittae on yellow ground color. Antenna of female with basal short flagellar segments oval and AR about 0.93. Scutellum yellow and with four median bristles. Legs mainly yellow; hind TR 2.56-2.7. Wing of female with rather dense macrotrichia and anal lobe obtuse. Abdominal sternites of female completely reduced to membranes; two caudal lobes of sternite 8 highly setigerous; subgenital plate with an oval ring at center and without basal ring; spermatheca round.

*Female*: Body about 1.11 mm. long. Wing about 0.81 mm. by 0.3 mm.

Head almost entirely yellowish brown, including mouthparts, eyes just touching above, proboscis short and shorter than half of length of head capsule (6.8:17); clypeus with seven or eight small setae. Maxillary palp very pale brown, segment 3 with few sensillae on middle part, as long as 4 and 5 together; four segments in proportion of 6:13:7:7. Antenna with scape dark brown and flagellum brown; short basal flagellar segments oval or elongate-oval, being 1.5 times or twice as long as basal width; AR 0.93-0.94; relative length of distal eight segments about 10:10.3:11.3:14.3:15:15.5:15:16.8.

Thorax broadly yellow, scutum with four brown vittae and pair of pale-brown, accessory, short, lateral vittae before scutal sutures, caudal part of caudoscuteal area slightly brownish, postscutellum brown; scutellum with four median bristles and central minute seta beside two lateral bristles. Legs mainly yellow, but knee joints and last tarsal segments brown; hind TR 2.56-2.7; hind tibial comb with six or seven apical bristles; relative length of leg segments, except for basal two, about 77:80:46:18.5:15.5:12.8:11.5 in fore, 100.5:100:50:19.5:17.5:12.5:11.5 in middle, and 95.9:92.5:63:24:21:16:11.5 in hind leg.

Wing with anal lobe very obtuse, macrotrichia rather dense and stigmal area pale brown. Venation: Costa ending about at middle of wing (32.5:62.5), relative length of R, M, and stem of fMCu about 15:11:22.5, Rs about 1.5 times of  $R_1$  (11.8:7.3), second radial cell about half as long as stem vein and slit-like,  $M_{3+4}$  about twice of  $Cu_1$  (20.3:10.5), fMCu before level of tip of  $R_1$  and its inner angle a little smaller than 45 degrees. Haltere entirely yellow.

Abdomen with tergites brown, but those on caudal segments paler or yellow, pleural membranes very pale brown, sternites uniformly membranous and very pale. Sternite 8 setigerous, highly setigerous on caudal lobes; subgenital plate with central oval ring-like structure on irregular dark area and without basal ring; cerci brown; spermatheca round (1.5+10 by 10 units), brown and with very small chitinized part of duct.

*Male*: Unknown.

#### DISTRIBUTION: Gilbert Is.

GILBERT IS. BUTARITARI: Butaritari I., two females, Dec. 1957, Krauss.

This unnamed species is somewhat allied to Micronesian *D. palauensis* and *D. furcillifera*. In the first allied species, however, the spermatheca is oval, the abdominal sternites are not reduced but square and the subgenital plate is not provided with central oval ring, distinctly differing from the present species. The second allied species is different from the present species in the following points: Sternites 3 to 7 are at least represented by paired hemisternites; sternite 8 is not setigerous on caudal lobes; the median chitinized structure is U-shape; and the spermatheca has hyaline punctures.

#### 73. *Dasyhelea perfida* Johannsen (fig. 61, a-c).

*Dasyhelea perfida* Johannsen, 1931, Archiv Hydrobiol. Suppl. 9, Tropische Binnengewässer 2: 424 (western Java).

Large, dark brown; coloration rather variable from dark to pale brown; antenna with distinct terminal stylet; scutellum yellowish brown, with two large lateral and four to six large median bristles and two to six small, median accessory setae; legs mainly yellowish brown or yellowish pale brown, at least hind femur with preapical, broad, brown cloud and sometimes, especially in female, femora with similar preapical brown cloud, and tibiae with broad, brown median cloud; wing with macrotrichia very sparse on membranes; haltere with stem brown and knob yellowish brown. Abdomen with many distinct pale punctures at bases of tergal and sternal setae. In male, sternite 9 subtrapezoid, aedeagus large with two pairs of caudal lobes, median lobe of parameres rather large and pointed, tergite 9 without distinct anal points. In female, spermatheca round with strongly curved neck part.

*Male*: Body length about 1.69 (1.52-1.97) mm. Wing about 1.0 (0.95-1.07) mm. by 0.33 (0.31-0.35) mm.

Head brown, with mouthparts yellowish brown but maxillary palp far paler; clypeus with six to eight setae. Maxillary palp with five segments in proportion of 4:7.2:14.1:8.5:10.6. Antenna with distinct slender terminal stylet, scape, flagellar segments, and plumose hairs brown; proportion of segments 2 to 10 and 11 to 14 about 102.7:95.5; distal eight segments in proportion of 10:9.6:9.8:10:21.6:19.4:17.5:36.5.

Thorax with scutum and postscutellum dark brown, scutellum yellowish brown, pleural and sternal sclerites brown in mature specimens; scutellum with two large lateral and five (rarely six) large median bristles and three (sometimes four, rarely two), small, median accessory setae. Legs with coxae pale brown, following segments gradually yellowish distally, hind femur broadly brown on preapical part, tibiae basally dark brown or brown, four basal tarsal segments pale yellow, ultimate tarsal segments pale brown, legs often much paler dark brown, with obscure brown clouds or basal bands; leg segments, except for coxae and trochanters, in proportion of 101.1:96.9:62.1:20.1:18.4:14.6:16.1 in fore leg, 118.6:114.7:70.1:21.9:19.4:15.8:16.6 in middle leg, and 117.3:108.1:80.9:28:23.3:17.3:18.1 in hind leg.

Wing with macrotrichia very sparse, costal and radial veins brown or pale brown. Venation: Costa far beyond middle of wing (43.6:77.3), Rs about 0.74 as long as R and about 1.43 as long as  $R_1$  (15.3:20.7:10.8), first radial cell absent, second cell small,

rhombic, and little shorter than half of stem (4.1:10), stem of fMCu about 1.64 as long as R (34:20.7), fMCu under tip of  $R_1$  and rarely just beyond it, tip of  $Cu_1$  just beyond tip of costa. Haltere with stem brown and knob yellowish brown or paler.

Abdomen with tergites brown, sternites pale brown, membranous areas very pale brown; tergites and sternites with distinct pale punctures at bases of setae. Hypopygium with sternite 9 trapezoid, with caudal area minutely spinulose and membranous; tergite 9 also trapezoid, about twice as long as sternite, and with obscure papilliform anal points. Coxite conical subtriangular in ventral aspect and about 1.4 as long as wide; style longer than coxite (33.6:30), very slightly arcuate, tapered, and rather pointed at tip. Aedeagus large, with basal concavity broad and shallow, its basal lateral points somewhat pointed and slightly curved at tip, two pairs of caudal lobes extended caudad, median pair darker, longer, and more pointed than lateral lobes; parameres with large median lobe, far longer than coxite (35.8:30), broad, blade-like, both ends narrowed and sharply pointed apically, basal arms rather slender, arcuate, and somewhat broad on lateral ends.

*Female:* Body about 1.56 (1.27-1.86) mm. Wing 0.97 (0.86-1.06) mm. by 0.38 (0.35-0.42) mm. General coloration similar to that of male.

Head dark brown, with mouthparts brown to yellowish pale brown; clypeus with about eight (7-10) setae. Maxillary palp very pale brown, segment 3 rather slender, last segment oval, with five segments in proportion of 3.6:6.9:14.1:7.8:9.3. Antenna with scape dark brown, flagellar segments brown, basal short flagellar segments short, somewhat oval, bottle-like or barrel-like, and with very short neck parts, segments 10 to 13 slightly different from preceding segments, somewhat longer, and with more distinct neck parts, last segment fusiform, twice or more as long as preceding one and with slender, rather long, terminal stylet; AR about 0.94 (0.9-0.98); distal eight segments in proportion of 11.1:11.6:11.9:13.4:14.1:14.1:13.8:29.1.

Thorax dark brown to brown, sometimes yellowish or paler, caudoscuteal area often paler, scutellum pale yellowish brown, with two large lateral and five or six, sometimes four, large median bristles and several (2-6) small median accessory setae. Legs almost entirely pale brown or yellowish pale brown, but coxae somewhat more brownish, all tibial bases and last tarsal segments brown, and hind femur broadly brownish before tip; in darker specimen, coxae basally brown, femora preapically broadly brown, and tibiae with broad, obscure, brown median clouds; leg segments, except for basal two, about 93.5:90.6:57.9:18.5:16.5:13.1:14.8 in fore leg, 106:108.5:62.8:20.2:18.4:14.4:15.3 in middle leg, and 108.5:102.9:76.1:26.1:22.1:16.1:16.9 in hind leg.

Wing with costal and radial veins pale brown or brown, macrotrichia sparse, second radial cell somewhat rhombic, brown or dark brown, and stigma-like. Venation: Costa ending far beyond middle of wing (44:73.1),  $R_s$  about as long as R and about 1.5 as long as  $R_1$  (18.9:17.8:12.7), first radial cell absent, second radial cell somewhat rhombic, brownish, stigma-like, about half as long as stem (5.8:12.1), but its inner space obscure or slit-like, stem of fMCu about 1.7 as long as R (30.4:17.8), fMCu just before or just beyond tip of  $R_1$ , tip of  $Cu_1$  slightly or just before tip of  $R_s$ . Haltere with stem brown and knob yellowish and with brown central spots.

Abdomen almost entirely dark brown or brown on dorsal side, sternites reduced to paired hemisternites, membranous areas yellowish fuscous, tergal hyaline punctures at bases of setae very distinct; cerci yellowish brown; spermatheca single, large, short, oval, brown, with neck part strongly curved, and about 22.7 by 17.4 units; subgenital plate rather slender, somewhat Y-shape and its stem part as slender as arms and slightly narrowed on middle part.

DISTRIBUTION: West Java, Mariana Is., Caroline Is., Marshall Is.

N. MARIANA IS. ANATAHAN: Female, Aug. 1951, R. Bohart.

S. MARIANA IS. GUAM: Umatac, male, March 1958, Krauss.

PALAU. BABELTHUAP: Ngerehelong Pen., female, May 1957, Sabrosky;  
Ngaremlengui, three females, May 1957, Sabrosky. KOROR: Female, three

males, Dec. 1947, Dybas; two females, Dec. 1952, Gressitt; two males, at light, Apr. 1953, Beardsley; two females, sweeping, Mar. 1954, Beardsley; 13 females, six males, Apr., May, June 1957, Sabrosky. MALAKAL: Female, two males, May 1957, Sabrosky. ULEBSEHEL: Female, beating, Jan. 1948, Dybas. PELELIU: North central part, two females, Aug. 1945, Dybas.

YAP. YAP: Hill behind Yaptown, female, Nov. 1953, Gressitt; S. Yap I., male, July-Aug. 1950, Goss.

CAROLINE ATOLLS. ULITHI: Fassarai I., female, July 1946, Townes. IFALUK: Ifaluk I., female, male, beating, July 1953, Bates. WOLEAI: Utagal I., two females, July 1946, Townes. KAPINGAMARANGI: Hare I., male, Aug. 1946, Townes.

TRUK. WENA: Male, 30 m., three males, 180 m., July 1946, Townes.

PONAPE. Sokehs: Female, sweeping, Feb. 1948, Dybas. Ponape; Colonia, airfield, male, June-Sept. 1950, Adams; Agric. Exper. Sta., Colonia, female, male, July-Sept. 1950, Adams; Agric. Exper. Sta., two females, light trap in cacao grove, Jan. 1953, Gressitt; Mt. Temwetemwensekir, 180 m., six females, Jan. 1953, Gressitt.

KUSAIE. Hill 1010, 300 m., female, light trap, Apr. 1953, Clarke; Mutunlik, male, Apr. 1953, Clarke; Malem, female, Apr. 1953, Clarke.

MARSHALL IS. JALUIT: Sydney Pier, male, Aug. 1946, Townes.

The Micronesian specimens seem to be somewhat different from Johannsen's description, but this species is rather variable in coloration of the body and size of the antennal and leg segments. For example, in Javanese male specimens, according to Johannsen, the last antennal segment is about 1.7 times as long as the penultimate, and the TR of the hind legs is about 2.89 while, in the Micronesian males, the last segment is about 2.1 (1.64-2.53) times as long as the penultimate, and, in relation to the fore TR, it is about 2.89 (2.42-3.2). The females follow Johannsen's description. The male hypopygium shown by Johannsen (1931) is distinctly different from the Micronesian males in the structure of the aedeagus and sternite 9; however, these are very difficult to draw exactly and perhaps he has overlooked the four lobes of the aedeagus and figured the dorsal or sternal setae 8 as sternal setae 9.

#### 74. *Dasyhelea subperfida* Tokunaga (fig. 61, d-f).

*Dasyhelea subperfida* Tokunaga, 1940, *Tenthredo* 3 (2):174 (Palau, Ponape).

Dark-brown or brown, rather large or medium-size; scutellum yellow and with four to nine median bristles and one to 11 small median accessory setae; antenna with terminal stylet; haltere with knob brownish to yellowish; abdominal tergites brown and with many hyaline or pale punctures at bases of setae. In male, antennal terminal stylet short, hypopygium with median lobe of parameres rather slender, long and aedeagus with two rather long caudal lobes. In female, terminal stylet of antenna distinct, flagellar segments mainly fusiform and segments 10 to 13 with short neck parts, spermatheca round and small.

*Male*: Body length about 1.72 mm. Wing about 0.98 (0.86-0.93) mm. by 0.26 (0.25-0.27) mm.

Head brown or dark brown, frontal tubercle somewhat cordate, mouthparts pale brown; clypeus with five or seven setae. Maxillary palp with five segments in proportion of 4.8:6.3:11.5:8.3:9.5. Antenna with scape dark brown and flagellum and plumose hairs brown, last segment with somewhat blunt, very short terminal stylet; proportion of segments 2 to 10 and 11 to 14 about 95.5:74.8 and distal eight segments in proportion of 9.8:9.8:10:10.5:19.6:18.1:17.3:23.6.

Thorax with scutellum yellow, other dorsal sclerites dark brown, pleural and sternal sclerites brown; scutellum with two lateral and four or five median bristles and one or two small median setae. Legs mainly yellowish pale brown or very pale yellowish brown,

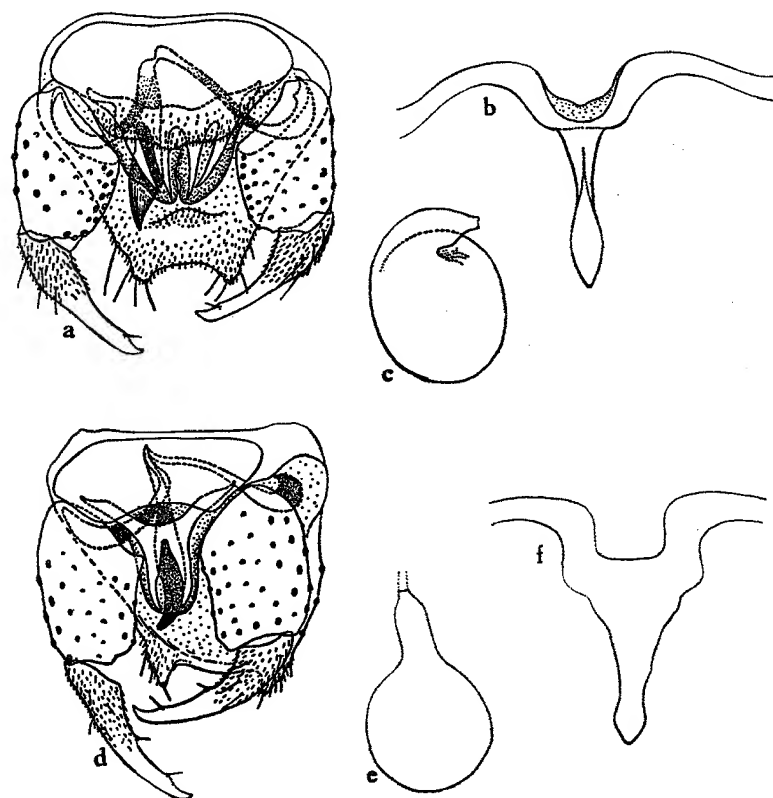


FIGURE 61.—a-c, *Dasyhelea perfida*: a, hypopygium, male; b, subgenital plate; c, spermatheca. d-f, *D. subperfida*: d, hypopygium, male; e, spermatheca; f, subgenital plate.

knee joints dark, hind coxa, fore tibia, and femur somewhat more brownish than other segments, last tarsal segments of legs more brownish and extreme bases of tarsal segments dark; leg segments, except for coxae and trochanters, in proportion of 92:93.5:59.5:22:19:14:15.5 in fore leg, 107.5:110.5:67.5:24:19.5:15.5:15.5 in middle leg, and 111:107:76.5:29.5:24:16:17 in hind leg.

Wing with macrotrichia of membrane very sparse, cell  $M_4$  with only eight or nine trichia and anal cell without trichia, anterior veins pale brown. Venation: Costa ending slightly beyond middle of wing (36:69), first radial cell absent, second cell square, and about 0.4 as long as stem (15.5:35), relative length of  $R$ ,  $R_1$ ,  $R_s$ , and stem of  $fMc_u$  about

18.5:9:13.5:31, fMCu under middle of second radial cell. Haltere with stem brown and knob more or less pale brown.

Abdomen brown, tergites with many hyaline punctures at bases of setae and inter-segmental bands pale brown; sternites reduced, sternite 1 completely membranized, 2 and 3 reduced to paired hemisternites, following sternites complete and brown, lateral and sternal membranes very pale brownish. Hypopygium brown; sternite 9 transverse, very short, median caudal part only slightly produced caudad and its caudal margin very slightly concave; tergite 9 almost as long as basal width, somewhat trapezoid, and with pair of small, blunt anal points. Coxite rather short, thick, about 1.4 as long as basal width (26:18.5); style rather slender, fully as long as coxite, slightly curved at middle, very slightly tapered, with apex pointed at extreme tip. Aedeagus with basal ridge rather long, V or U-shape, its basal roots widely divergent, caudal two lobes parallel, rather long, fully as long as basal roots, and not pointed at tip; parameres with long median lobe and asymmetrical basal arms, median lobe compressed laterad, broader on basal part, and curved at broadest part, pointed at basal tip, bluntly ended at tip, and fully as long as, or slightly longer than, coxites (27.5:26); sinistral basal arm very slender, almost straight, but slightly broad and curved only at tip near coxite base, dextral arm rather short, broader than other arm, and strongly curved.

*Female*: Body length about 1.69 mm. Wing about 1.05 mm. by 0.4 mm. Coloration generally as in male.

Head brown, with eyes very narrowly separated above, frontal tubercle chestnut-like, proboscis about two-fifths as long as vertical length of head; clypeus with about nine or ten setae. Maxillary palp rather stout and with five segments in proportion of 5:9.5:16:9.5:8.3. Antenna with segments 10 to 13 somewhat fusiform and each with short neck part, last segment about 1.6 as long as preceding one (24:15) and with slender terminal stylet; AR about 0.81 (81:100); proportion of distal eight segments about 11.5:12:12:13.5:14.5:15:15:24.

Thorax almost entirely brown, but scutellum paler, with about 11 large bristles, including lateral ones, in arcuate line along caudal margin and about ten small accessory setae. Legs with coxae brownish as in thoracic pleurites, other segments all pale yellowish pale brown; leg segments except for basal two, about 114:111:71.5:28:21:16:17 in fore leg, 128:134:82:30:22:16.5:17 in middle leg, and 132:128:91:39:27:18:18 in hind leg.

Wing with macrotrichia rather dense, but bare areas along veins distinct, costal and radial veins brown. Venation: Costa ending far beyond middle of wing (49:80), at basal one-third of caudal margin of cell  $M_4$ ,  $R_s$  longer than  $R$  and about 1.38 as long as  $R_1$  (22:19:16), first radial cell absent, second cell about half as long as stem (28:56), fMCu under middle of  $R_s$ , Cu, ending just beyond tip of  $R_1$ . Haltere with stem brown and knob yellow.

Abdomen with tergites pale brown, reduced sternites pale yellow, lateral membranes yellowish pale brown; tergites with distinct pale minute punctures at bases of setae; cerci brown; spermatheca round, brown, small, and about 16 by 15 units; subgenital plate without basal ring, but with subtriangular basal plate, much longer than basal width.

#### DISTRIBUTION: Bonin Is., S. Mariana Is., Caroline Is.

BONIN IS. HAHU JIMA: Okimura, two females, April-May 1958, Snyder.  
CHICHI JIMA: Omura, Camp Beach, female, May-June 1958, Snyder.

S. MARIANA IS. TINIAN: Female, Mar. 1945, Dybas. GUAM: Yigo, two females, Feb. 1958, Krauss.

PALAU. BABELTHUAP: Ulimang, female, Dec. 1947, Dybas; Ngaremlengui, two females, two males, June 1957, Sabrosky; Melekeiok, female, May 1957, Sabrosky. KOROR: Two females, male, May, July 1957, Sabrosky.

YAP. YAP: Dugor, female, May 1957, Sabrosky; Kolonia, male, July-Aug. 1950, Goss; Kolonia, female, June 1957, Sabrosky.

TRUK. WENA: Female, 120 m., June 1946, Townes.

PONAPE. Near Colonia, female, Aug. 1946, Townes; Colonia, male, Mar. 1949, Maehler; Mt. Temwetemwensekir, 180 m., female, light trap, Jan. 1953, Gressitt.

KUSAIE. Mutunlik, female, Feb. 1953, Clarke.

**75. *Dasyhelea dybasi* Tokunaga and Murachi, n. sp. (fig. 62, a).**

Rather large, brown; frontal tubercle with three semicircular dorsal lobes and triangular ventral lobe, antenna with terminal stylet; scutellum brown to pale brown and with four to seven strong median bristles and one to three small accessory setae at middle part; wing with rather dense macrotrichia, even in anal cell; abdominal tergites with pale, very minute punctures at bases of setae. In male, style long, fully as long as coxite, aedeagus with pair of rather large caudal lobes; parameres symmetrical, with simple long median lobe. In female, flagellar segments mainly oval, antennal terminal stylet short, spermatheca round and large.

*Male:* Body length about 1.58 mm. Wing about 0.29 mm. by 0.93 mm.

Head brown, with eyes broadly contiguous above, mouthparts yellowish brown; clypeus with eight to 11 setae. Maxillary palp rather slender, with last segments somewhat cylindrical and five segments in proportion of 3.8:6.5:13.2:6.8:10. Antenna with scape dark brown, flagellar segments and plumose hairs brown, last segment with distinct terminal stylet; proportion of segments 2 to 10 and 11 to 14 about 114.2:98; distal eight segments in proportion of 11.5:11:11.3:11.5:24.8:23.5:20:30.

Thorax including scutellum uniformly brown; scutellum with two strong lateral and four strong median bristles and small median accessory seta. Legs with coxae brown, other segments almost entirely pale brown, but apical half of hind femur as brownish as coxa; leg segments from femora in proportion of 93:88:53.5:17.5:17:12.5:12 in fore leg, 109:106:60:19.5:17.5:13.5:13 in middle leg, and 104:98:69.5:24:21.5:15:14 in hind leg.

Wing with anal lobe obtuse, macrotrichia of membrane rather dense, cell  $M_4$  with about 20 trichia and anal cell with many trichia on caudal marginal area, bare areas along veins broad, costal and radial veins yellowish pale brown. Venation: Costa ending far beyond middle of wing (40:69.8),  $R_s$  about 0.73 as long as  $R$  and about 1.56 as long as  $R_1$  (14.5:19.8:9.3), first radial cell absent, second cell ending obliquely, about half as long as stem (19:36.5), stem of  $fMc_u$  about 1.59 as long as  $R$  (31.5:19.8),  $fMc_u$  under, or just before, level of tip of  $R_1$ . Haltere with stem brown and knob yellowish pale brown.

Abdomen with tergites all brown, pale punctures at bases of tergal setae indistinct and very minute, sternite reduced and lateral membranes pale brown. Hypopygium: Sternite 9 with broad median caudal projection, subtriangular, rounded, and hyaline at tip; tergite 9 somewhat trapezoid, slightly shorter than basal width, and with pair of distinct anal points. Coxite conical, tapered, about 1.4 times as long as wide (26:18.8); style fully as long as coxite (26.5:26), slightly arcuate, tapered, and with pointed apex. Aedeagus rather large, with basal arch very shallow, broad, and V-shape, two caudal chitinized lobes rather long, extended caudad, and more or less curved at tips; parameres symmetrical, with median lobe long, slightly shorter than coxite, almost straight, ending at level of tips of aedeagal lobes, its basal two-thirds gradually thickened distad, then apical one-third tapered, and its apex not sharply pointed, basal arms arcuate, slender on mesal parts, and broadened laterad.

*Female:* Body about 2.09 mm. Wing about 1.01 mm. by 0.38 mm. General coloration similar to that of male.

Head brown, with eyes very narrowly separated above; frontal tubercle slightly concave on shoulder parts, upper part and lateral parts semicircular, and ventral part triangular as in male; mouthparts with labrum brown, labellum and palp yellow; clypeus with about six setae; proboscis rather short, slightly longer than half of vertical length (12:22). Maxillary palp rather stout and five segments in proportion of 7:12:12:9.5:11. Antenna with segments 3 to 13 round to oval, segments 10 to 13 not distinctly different

in shape and size from preceding ones, ultimate segment elongate, oval, and with blunt apical stylet; AR about 0.72 (63:87); proportion of distal eight segments about 10.5:10:10.5:11:11:11.5:11.5:19.

Thorax brown but scutellum pale brown, pleural membranes yellow, pleural and sternal sclerites paler than scutum; scutellum with about nine large bristles, including lateral ones, in line along caudal margin and two or three small accessory setae on central area. Legs with segments all pale brownish yellow and articulations brown; proportion of leg segments from femora to tarsi about 101:100:62:23:19:16.5:17 in fore leg, 113:117:74:26.5:20.5:17:17 in middle leg, and 114:115:83:30:25:19:18 in hind leg.

Wing with macrotrichia rather dense, but bare areas along veins distinct, costal and radial veins pale brown. Venation: Costa ending far beyond middle of wing (48:79), Rs long, as long as R and about 1.58 as long as  $R_1$  (19:20:12), first radial cell absent, second cell about 0.6 as long as stem (28:46) and inner space narrow, stem of fMCu about 1.48 as long as R (29.5:20), costa ending at level of basal one-third of anal margin of cell  $M_4$ , fMCu just before middle of Rs,  $Cu_1$  ending under middle of second radial cell. Haltere with knob pale brownish yellow.

Abdomen with tergites brown, sternites reduced and yellow, pleural membranes yellow; tergites with distinct pale minute punctures at bases of setae; intersegmental yellow bands distinct; spermatheca brown, round, 20 by 22.5 units, and with small chitinated duct.

Holotype, male (US 64036), Koror I., Palau Is., Nov. 22, 1947, Dybas. Allotype, female (BISHOP 2572), Colonia, Ponape I., Mar. 1-8, 1949, Maehler. Paratype, male (CM), same data as for holotype.

DISTRIBUTION: Caroline Is. (Palau, Ponape).

This species is related to *D. perfida* and *D. subperfida*. However, in the male of *perfida*, antennal segment 11 is a little shorter than twice 10 (15:8), the ultimate segment is fully 1.7 as long as the penultimate, the thorax, including the scutellum, is yellow, the scutum sometimes has three brown vittae, TR of the hind leg is about 2.75, the wing vein costa extends slightly beyond fMCu, and the knobs of the halteres are white. In the female of *perfida*, AR is about 0.83. In the male of this species, antennal segment 11 is longer than twice 10 (24.8:11.5), the ultimate segment is only 1.5 as long as the penultimate, the thorax is mainly brown, including the scutellum, the scutum has no brown vittae, TR of the hind leg is at least 2.87, the wing vein costa extends far beyond fMCu and the knobs of the halteres are yellowish brown. In the female of this species, AR is about 0.72. *D. subperfida* and this species may be distinguished from each other by the key.

#### 76. *Dasyhelea sagittifera* Tokunaga and Murachi, n. sp. (fig. 62, b).

Medium size, somewhat shiny, brown to yellow; antenna with minute terminal stylet; scutum largely brown, with yellowish-brown caudoscuteal area, scutellum yellow, with five median bristles and one to five median accessory setae; legs mainly pale brown, but middle femur yellow. Male hypopygium with large curved styles and sternite 9 with peculiar sagittate caudal projection. In female, antennal segments 3 to 5 discoidal, 6 to 9 round to oval, 10 to 13 oblong, spermatheca small and round.

*Male*: Body length about 1.56 mm. Wing about 0.99 mm. by 0.31 mm.

Head dark brown, with frons and mouthparts brown; clypeus with about ten setae. Maxillary palp slightly brownish hyaline, with five segments in proportion of ? : 7 : 17 : 7 : 8. Antenna with scape dark brown, other segments and plumose hairs brown, with



minute terminal stylets; proportion of segments 2 to 10 and 11 to 14 about 84:91, distal eight segments in proportion of 8:8:9:11:22.5:24:20.5:24.

Thorax with anterior half of scutum dark brown, caudoscuteal area extensively yellowish brown, with faint, brownish median stripe and brown along caudal margin, lateral parts broadly yellowish brown, pair of dark stripes extending along foveae; scutellum yellow, with pair of lateral and five median bristles and small accessory median seta; other sclerites of thorax brown. Legs generally pale brown, all coxae pale brown on dorsal sides and yellow on ventral sides; in fore and hind legs, trochanters pale brown on basal half and yellow on apical half, femora basally yellow and very broadly pale brown on apical three-fourths, knee joints brown, tibiae pale brown, four basal tarsal segments very pale brownish, last tarsal segments pale brown; in middle leg, trochanter and femur all yellow, other segments as in other legs; leg segments, except basal two, about 108:104:59:23.5:20.5:16:16 in fore leg, 119:118:60:23:21:15.5:15 in middle leg, and 116:111:74:28:18:17 in hind leg.

Wing with anterior veins pale brown, macrotrichia sparse, but rather dense on apical quarter, cell  $M_4$  with about 15 trichia. Venation: Costa very slightly beyond middle of wing (40:76),  $R_s$  about half as long as  $R$  and one-third stem of fMCu (11:20.5:32),  $R_1$  about 0.2 as long as stem of fMCu and longer than half of  $R_s$  (6.5:32:11), first radial cell absent, second radial cell rather large and little shorter than stem (45:50). Haltere with stem brown and knob yellowish pale brown.

Abdomen with tergites brown, without pale intersegmental bands and pale punctures at bases of setae, sternal and lateral membranes brown. Hypopygium brown; sternite 9 transverse, with small chitinized ridge between bases of coxites, caudal projection very long, fully as long as tergite 9, chitinized on lateral margin, strongly constricted preapically, apical one-third somewhat spindle-shaped, with small filament at tip and pair of small chitinized preapical hooks extended backward; tergite 9 rounded, with pair of blunt minute anal points. Coxite swollen basally mesad, about 1.6 as long as basal width (55.5:34); style far longer than coxite (70:55.5), strongly curved and somewhat narrowed at basal one-third, apical two-thirds slightly broadened apically, bare, very slightly curved, and ended bluntly. Aedeagus with basal chitinized edge strong and with pair of large lateral scale-shaped sclerites which arise from lateral ends of basal bar, broadened apically, recurved ventrad, and with denticulate apical edges; parameres with median lobe small and somewhat square, basal arms slender on basal half and rather broad and subtriangular or lunate on apical half before articulation of coxite.

*Female:* Body about 1.44 mm. long. Wing about 0.82 mm. by 0.34 mm. General coloration as in male.

Head brown, eyes very narrowly separated above, mouthparts yellowish brown, frontal tubercle semicircular on dorsal half and subtriangular on ventral half; clypeus with eight or nine setae; proboscis rather long, about half as long as vertical length of head capsule. Maxillary palp yellow, rather stout, and with five segments in proportion of 3.5:7.5:11.8:7.3:7.5. Antenna with basal segments 3 to 5 somewhat discoidal, 6 to 7 or 6 to 8 round, 7 to 9 or 8 to 9 oval, 10 to 13 oblong, last segment almost twice as long as preceding one (19.8:10.8), three times as long as wide, and with rather short terminal stylet; AR about 0.9 (64.5:71.3); distal eight segments in proportion of 9.3:9.5:9.5:11:11.3:11.3:10.8:19.8.

Thorax with scutum generally brown, but lateral parts, caudoscuteal area, and narrow stripes on foveae paler; scutellum pale brown, with seven large bristles, including two lateral bristles, arranged in line along caudal margin and with five small median accessory setae; postscutellum brown; pleural and sternal sclerites yellowish brown. Legs with coxae yellowish brown, other segments all yellow; leg segments from femora to tarsi about 85.5:82:54:17.5:15.3:13.8:15.5 in fore leg, 95:99:58.3:19.3:16.5:13.5:15.5 in middle leg, and 98:93.5:66.3:23.5:18:13.5:15 in hind leg.

Wing with macrotrichia rather dense, but bare areas along veins broad, cell  $M_4$  with about 30 trichia, stigmal area and related veins brownish yellow or brown. Venation: Costal end far beyond middle of wing (38.3:62.8) and at level of basal quarter of anal

margin of cell  $M_4$ ,  $R_s$  a little longer than  $R$  and about 1.3 as long as  $R_1$  (16.5:15.3:12.8), first radial cell absent, second cell about 0.54 as long as stem and inner space obliterated, stem of fMCu about 1.69 as long as  $R$  (21.3:39.3), fCMu just beyond middle of  $R_s$ ,  $Cu_1$  ending just beyond costal end. Haltere with stem pale brown and knob yellow.

Abdomen with tergites brown, reduced sternites pale yellow, pleural membranes yellowish brown, tergites with minute pale punctures at bases of setae; intersegmental paler bands absent; cerci pale brownish yellow; spermatheca brown, round, 15 by 20 units, with distinct chitinized duct.

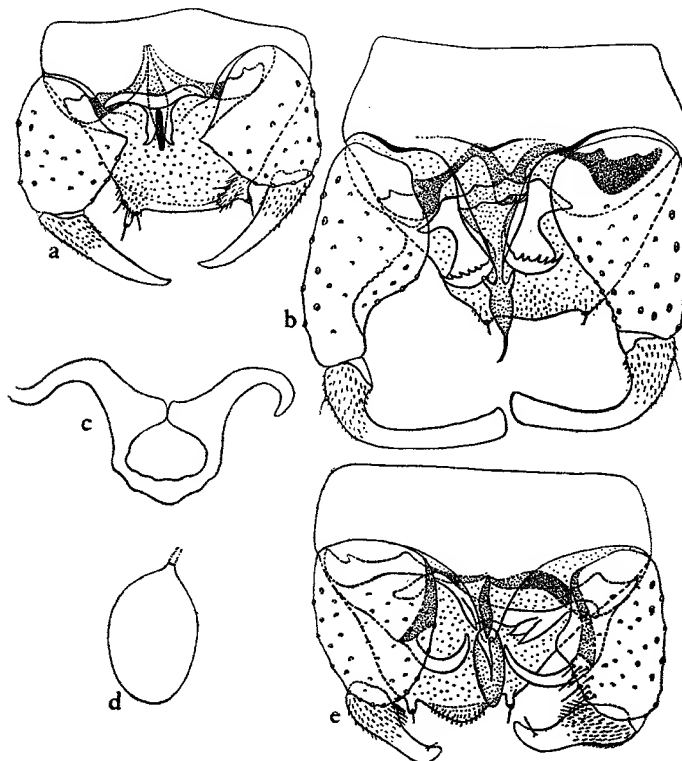


FIGURE 62.—a, *Dasyhelea dybasi*, hypopygium, male. b, *D. sagittifera*, hypopygium, male. c-e, *D. quarternihamata*: c, subgenital plate; d, spermatheca; e, hypopygium, male.

Holotype, male (US 64037), Afenia, Saipan I., June 29, 1946, Townes. Allotype, female (CM), As Mahetog, Saipan I., May 1-6, 1945, Dybas.

Other specimens, female, Ngaremlengui, Babelthuap I., Palau Is., June 1, 1957, Sabrosky; male, Majetto I., Jaluit A., Marshall Is., Aug. 24, 1946, Townes.

DISTRIBUTION: Mariana Is. (Saipan), Caroline Is. (Palau), Marshall Is. (Jaluit).

This species is so extremely peculiar in the structure of the male hypopygium that it is difficult to name an allied species. The styles are much longer than the coxites, sternite 9 is uniquely developed into a large sagittiform projection to which the species name is related, and the aedeagus has specific large, dentate, caudal lobes.

**77. *Dasyhelea quarternihamata* Tokunaga and Murachi, n. sp. (fig. 62, c-e).**

Rather small, dark-brown; antenna without terminal stylet; scutellum with two large lateral and four, very rarely five, large median bristles and without small accessory setae; legs mainly dark brown, except for four pale basal tarsal segments; wing with costal and radial veins dark brown and macrotrichia sparse; abdomen without distinct pale punctures at bases of tergal setae. In male, hypopygium with pair of dark, large, sickle-like processes at bases of coxite, sternite 9 with caudal spatula-like projection and style rather short and stout. In female, AR about 0.86, veins around second radial cell thickened, spermatheca rather large and oval, and subgenital plate with caudal arms directly arising from large basal ring, with broad bases, straightly extended laterocaudad, tapered, and then curved at tips.

*Male:* Body length about 1.4 mm. Wing about 0.87 mm. by 0.26 mm.

Head dark brown or brown, with frontal tubercle somewhat rhombic, frons and mouth-parts brown; clypeus with about seven setae. Maxillary palp pale brown and slender; five segments in proportion of 3:6:16:8:9. Antenna with scape dark brown and flagellar segments and plumose hairs brown; distal eight segments in proportion of 8.5:8.8:8.3:9:17.5:20.5:17.5:19; proportion of segments 2 to 10 and 11 to 14 about 88:74.5; terminal stylet absent.

Thorax mainly dark brown, but scutellum yellow or slightly fuscous yellow with brownish lateral corners, pleural and sternal sclerites brown; scutellum with two large lateral and four large median bristles and without small median accessory setae. Legs with coxae, trochanters, femora, tibiae, and last tarsal segments somewhat dark brown and four basal tarsal segments pale brown; leg segments, except for basal two, in proportion of 89.5:85.5:42.5:18.3:17.3:13:12.5 in fore, 100.5:98:45.5:21:18.5:14.3:13 in middle, and 96.5:89.5:52:23:20:14.3:12.5 in hind leg.

Wing with macrotrichia very sparse, cell  $M_4$  with three or four trichia and anal cell without trichia; anterior veins dark brown. Venation: Costa ending a little beyond middle of wing (33.5:65),  $R_s$  a little shorter than half of  $R$  (8.5:18.8) and about 1.6 as long as  $R_1$  (8.5:5.3), first radial cell absent, second cell somewhat oval and about 0.65 as long as stem, fMCu a little beyond level of costal end, stem of fMCu about 1.6 times as long as  $R$  (30:18.8). Haltere entirely brown.

Abdomen with tergites dark brown or brown, without distinct paler intersegmental bands, anterior tergites with indistinct pale punctures at bases of setae, sternites reduced to paired small sclerites, pleural and sternal membranes pale fuscous brown. Hypopygium dark brown; sternite 9 without bristles, median caudal part projected caudad as far as caudal end of tergite 9 and doubly curved at distal one-third, its basal two-thirds tapered and somewhat triangular, and its distal one-third oval and spatula-like, with thickened axis and thin lateral lamellae; tergite 9 broad, rounded, with pair of minute peg-like anal points. Coxite rather broad, 1.6 as long as wide (28.8:18) and somewhat expanded mesad on preapical parts forming setigerous lobe; style far shorter than coxite (24.5:28.8), about four times as long as basal width, very slightly arcuate and tapered, with apex not sharply pointed. Aedeagus transverse, very slightly arcuate, with small paired chitinized lobes, closely applied along basal arch and not projected caudad, basal lateral ends curved laterocaudad; parameres highly asymmetrical; sinistral basal arm smaller, slender on mesal one-third, and broadened on lateral two-thirds; dextral basal arm larger and broader, constricted at two points: Mesal part very broad, middle part rather slender, and lateral part rather broad, median lobe slender, pointed, small, closely applied along mesal margin

of dextral arm, and not extended beyond aedeagus. In ventral aspect, hypopygium with pair of large, black, sickle-like accessory processes arising from mesal parts of basal ridges of coxites.

*Female:* Body length about 1.24 mm. Wing about 0.68 mm. by 0.28 mm. Coloration generally similar to that of male.

Head: Clypeus with about ten (8-13) setae, maxillary palp with five segments in proportion of 3.5:5.7:12.5:6.4:9.8. Antenna without terminal stylet, basal short flagellar segments round to oval, distal segments 10 to 13 slightly longer than basal and not distinctly different, last segment with round tip; AR about 0.86 (0.82-0.92, 55.4:64.3); distal eight segments in proportion of 8.5:8.4:8.1:9.6:10.6:10.7:10.4:14.4.

Thorax: Scutellum pale brownish yellow, yellowish brown or yellow, but lateral margins more brownish, with two large lateral and four large median bristles, or very rarely with five median bristles, and without small accessory setae. Legs with coxae as deep, or dark, brown as thoracic pleurites; trochanters, femora, tibiae, and last tarsal segments brown and somewhat fuscous; four basal tarsal segments pale brownish yellow or pale brown; proportion of leg segments, except for basal two, about 73.4:71.1:35.4:15.6:13.6:10.6:11.1 in fore leg, 85:83.8:38.5:17.2:15.2:10.9:11.4 in middle leg, and 82.4:78.4:45.8:19.7:16.6:11.6:11.6 in hind leg.

Wing with macrotrichia rather sparse, anal cell with trichia on caudal half along anal margin, cell  $M_4$  with 19 to 28 trichia, costal and radial veins slightly dark brown, veins related to radial cells thickened. Venation: Costa ending slightly beyond middle of wing (27.1:52),  $R_s$  thickened distally, about 0.65 as long as  $R$  and about 1.65 as long as  $R_1$  (8.4:13.1:5.1), first radial cell absent, second cell about 0.74 as long as stem (14.2:19.2) and inner space slit-like, fMCu under tip of  $R_1$  or more distal, under middle of second radial cell,  $Cu_1$  ending under tip of  $R_s$  or slightly beyond it. Haltere entirely dark brown, brown or only slightly pale brownish yellow on middle parts of knob.

Abdomen with tergites dark brown, sternites brown, pleural membranes dark, intersegmental tergal bands very narrow and yellowish, tergites with rather indistinct brown punctures at bases of setae, sternites 3 to 4 subdivided into paired hemisternites; cerci brown; spermatheca rather large, oval, with short chitinized duct and theca about 21.6 by 16.4 units; subgenital plate with large reniform basal ring and two caudal arms directly arising from basal ring with broad bases, widely divergent laterad, extended straight, tapered and curved on slender apical parts.

Holotype, male (US 64038), Pis Islet, Truk A., Truk, June 3, 1946, Townes. Allotype, female (US), Afenia, Saipan I., Mariana Is., June 29, 1946, Townes. Paratypes:

Caroline Atolls. Male, Mokil, Jan. 27, 1953, Gressitt; female, Pingelap, Jan. 26, 1953, Gressitt.

Truk. Female, male, same data as for holotype.

Ponape. Female, Colonia, June-Sept. 1950, Adams; female (BISHOP), Mt. Temwetemwensekir, 180 m., Jan. 16-19, 1953, Gressitt.

Marshall Is. Female (US), Sydney Pier, Jaluit, Aug. 23, 1946, Townes.

Other specimens, eight females, six males, Colonia, Ponape, June 15, 16, 1950, Adams; female, male, Nanpohnmal, Ponape, Oct. 8, 1956, Strecker.

DISTRIBUTION: Mariana Is. (Saipan), Caroline Is. (Truk, Ponape, Mokil, Pingelap), Marshall Is. (Jaluit).

This species is quite peculiar because of a pair of large characteristic hook-like processes which arise from the bases of the coxites in male hypopygium, and because of the structure of the subgenital plate in female. The coloration

somewhat resembles that of *D. fumala* and *D. nigroris*, but these three species may be rather easily distinguished from each other. The species name is related to the two additional sickle-like appendages of the two styles.

**78. *Dasyhelea truncata* Tokunaga and Murachi, n. sp. (fig. 63, a-c).**

Rather small, dark-brown; last antennal segment oval, without terminal stylet; scutellum brown with two large lateral and two large median bristles and without small accessory setae; legs as brown as thoracic pleurites, except for four pale brown basal tarsal segments; wing with second radial cell rather large and brown, macrotrichia sparse; haltere with stem brown and knob yellow; abdominal tergites without pale punctures at bases of setae. In male, hypopygium with style small and stout, aedeagus with basal arch small and caudal lobes large, parameres consisting of two slender basal arms and without median lobe, tergite 9 with caudal end truncate and without anal points.

*Male:* Body length about 1.38 mm. Wing about 0.79 mm. by 0.27 mm.

Head brown, with mouthparts yellowish pale brown; clypeus with about ten setae, Maxillary palp rather slender, with five segments in proportion of 4:8:16.5:6.5:10. Antenna with scape dark brown, flagellar segments and plumose hairs brown, apical four segments relatively short, subfusiform, each with a single node; basal flagellar segment spherical to fusiform and with verticils rather sparse, basal striation more or less developed but reticulation poorly developed only on ultimate segment; ultimate segment oval and blunt at tip; proportion of segments 2 to 10 and 11 to 14 about 94:51, distal eight segments in proportion of 7.8:8:8:8.5:11:11.5:10.8:14.5.

Thorax with scutum and postscutellum dark brown, scutellum yellow, differing from brown on other parts of thorax, with small brown median spot, two median bristles and sometimes accessory minute seta at center; pleural and sternal sclerites brown. Legs with coxae, trochanters, femora, tibiae, and last tarsal segments as brown as pleural sclerites and four basal tarsal segments pale brown; leg segments, except for coxae and trochanters, in proportion of 87:88:42:17:14.5:13:12 in fore leg, 111:101:49:20:17:14:13 in middle leg, and 99:90:51:21.5:19:13.5:13 in hind leg.

Wing entirely very pale brown, with macrotrichia very sparse, cell  $M_4$  and anal cell with less than five trichia, second radial cell rather large, brown, and stigma-like. Venation: Costa ending far beyond middle of wing (35:61),  $R_s$  very short, only twice r-m (25:13), shorter than half of R (8.5:19), and 1.7 as long as  $R_1$  (8.5:5), veins around second radial cell thickened and brown, first radial cell absent, second cell large, little shorter than stem (14:16), stem of fMCu about 1.34 as long as R (25.5:19), fMCu under costal end,  $M_{3+4}$  and  $Cu_1$  strongly curved and ending at wing margin in a right angle. Haltere with stem brown and knob yellow.

Abdomen uniformly dark brown or deep brown; sternite complete, subsquare and with paired elongate-oval hyaline spots. Hypopygium: Sternite 9 with thickened basal ridge, membranous and spinulose on caudal half, and somewhat triangular, projected caudad; tergite 9 rather long, trapezoid, truncate at caudal end and without anal points, with small shallow incision at middle of caudal margin. Coxite conical, triangular in ventral aspect, about 1.7 as long as wide; style about 0.6 as long as coxite, rather short, stout, pubescent except for apical end, slightly tapered, arcuate, and truncate at tip. Aedeagus with basal ridge slender, very shallowly W-shape, two caudal lobes projected caudad, tapered, rather pointed, long, and closely fused with basal ridge; parameres without median lobe, basal arms slender, long, and arcuate.

*Female:* Unknown.

Holotype, male (US 64039); eastern coast, Peleliu I., Palau Is., Jan. 26, 1948, Dybas.

Other specimen, male, Ngarbaged, Koror I., Palau Is., at light, May 17, 1957, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau).

This species is allied to *D. fumala* in general structure and coloration, but the male hypopygium is very distinctly different. In *fumala*, tergite 9 bears the paired slender anal points, the aedeagus is small, somewhat transverse, and wider than long, and the parameres have a median lobe. In this species, tergite 9 is subtrapezoid with no anal points, the aedeagus bears long caudal lobes, longer than wide, and the parameres have no median lobe. The species name is related to the subtrapezoid ultimate tergite.

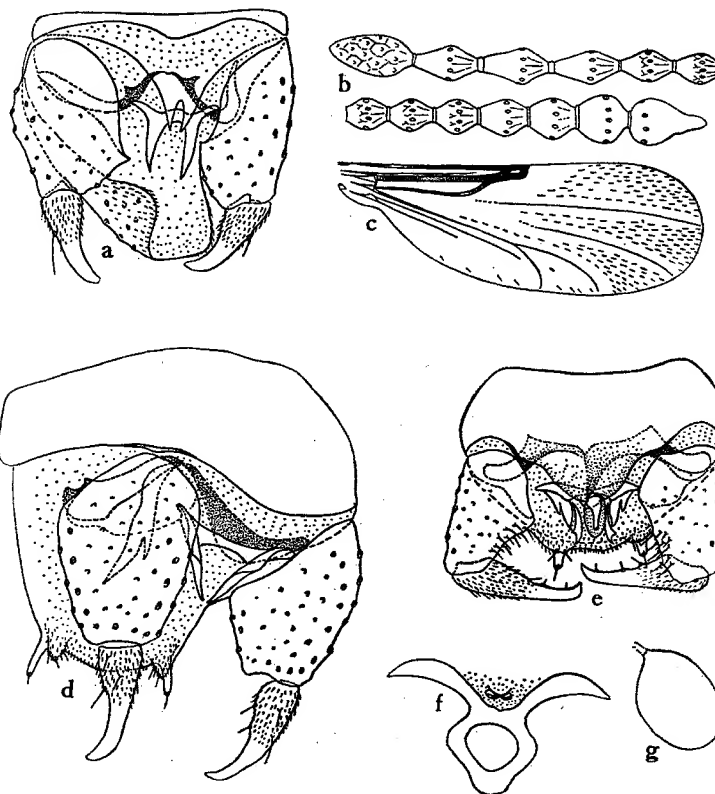


FIGURE 63.—a-c, *Dasyhelea truncata*, male: a, hypopygium; b, flagellar antennal segments; c, wing. d, *D. palloris*, hypopygium, male. e-g, *D. insularis*: e, hypopygium, male; f, subgenital plate; g, spermatheca.

**79. *Dasyhelea palloris* Tokunaga and Murachi, n. sp. (fig. 63, d).**

Rather large, pale-brown; last antennal segment without terminal stylet but with papilliform tip; scutellum very pale brown and with two large lateral and two large median bristles and without small accessory setae; wing with macrotrichia sparse. In male, hypopygium closely similar to that of *D. peliliouensis*, but aedeagus triangular and basal bar straight, thus differing from allied species.

*Male*: Body about 1.55 mm. Wing about 0.88 mm. by 0.3 mm.

Head brown, with mouthparts pale brown; clypeus with about eight setae. Maxillary palp very pale yellowish brown, with five segments in proportion of 4:8:14.5:6:8. Antenna with scape deep brown, flagellar segments and plumose hairs brown, last two segments partially fused, ultimate segment without distinct terminal stylet but with small papilliform tip; proportion of segments 2 to 10 and 11 to 14 about 86.5:62.3; distal eight segments in proportion of 8.3:8.3:8.5:8.8:9:16:18:28.

Thorax pale brown, but caudoscuteal area and scutellum very pale brown, scutellum with two large lateral and two large median bristles and without small accessory setae. Legs with coxae pale brown, articulations and last tarsal segments brown, other segments very pale brownish hyaline; proportion of leg segments, except for basal two, about 85:85:43:17.5:15:13:12 in fore leg, 101:100:57:20.5:16.5:13:12 in middle leg, and 97:92:59:23:20:13.5:12 in hind leg.

Wing with very sparse macrotrichia, cell  $M_4$  and anal cell without trichia, cell  $M_1$  with trichia at distal area in a line below vein  $M_1$ , cell  $M_2$  with trichia in a line above  $M_{3+4}$ , only, costal and radial veins pale brown. Venation: Costa ending little beyond middle of wing (35.5:67),  $R_s$  about 0.45 as long as  $R$  and about 1.4 as long as  $R_1$  (9:20:6.5), first radial cell absent, second cell obscure and incomplete, connection between costa and radial veins being obsolete, about 0.44 as long as stem (12:27), stem of fMCu about 1.6 as long as  $R$  (32:20), fMCu slightly beyond costal tip. Haltere with stem pale brown and knob pale yellowish hyaline.

Abdomen pale brown generally, tergites with distinct pale punctures at bases of setae. Hypopygium with sternite 9 transverse and caudal demarcation obscure; tergite 9 rather long, trapezoid, with pair of slender, rather long, anal points. Coxite conical, only 1.17 as long as basal width; style slightly arcuate, far shorter than coxite (22:27.5), slightly thickened and pubescent basally, tapered and bare apically. Aedeagus triangular, with basal bar strong and straight, caudal lobes arising from lateral ends of basal bar, straight, convergent with each other distad, and rather pointed at tip; parameres with median lobe as long as style (22:22), almost straight, sharply pointed apically, middle part somewhat broadened with minute blunt projection, basal arms rather broad, short, asymmetrical, sinistral arm lunular in shape, dextral somewhat angulate and much broader.

*Female*: Unknown.

Holotype, male (US 64040), Rota, Rota I., Mariana Is., June 23, 1946, Townes.

DISTRIBUTION: Southern Mariana Is.

This species is closely allied to *D. peliliouensis* in the structure of the hypopygium, but the general coloration and chaetotaxy of the scutellum are quite different. This species is named in relation to the pale color of the body.

#### 80. *Dasyhelea insularis* Tokunaga (fig. 63, e-g).

*Dasyhelea insularis* Tokunaga, 1940, Philippine Jour. Sci. 71 (2): 214 (Kusaie); 1940, Tenthredo 3 (2): 172; 1941, Annot. Zool. Japon. 20 (2): 110 (Truk).

Rather small, dark-brown or brownish-black; antenna without terminal stylet; scutellum pale brown in male and yellowish in female, with four large median bristles and rarely with small median accessory seta. In male, wings with costal and radial veins dark, macrotrichia on membrane very sparse, only two or four trichia in cell  $M_4$  and none in anal cell; abdomen with tergites with minute hyaline punctures at bases of setae; hypopygium without median lobe of parameres, aedeagus somewhat triangular with pair of hook-like median small lobes and pair of denticulate, lateral small lobes; sternite 9 with median, vertically recurved, small caudal projection. In female, antenna rather short,

flagellar segments 4 to 13 tapered, 10 to 13 about twice as long as wide, ultimate segment much longer than preceding and somewhat pointed at tip; abdominal sternites 3 to 5 subdivided to paired hemisternites; spermatheca deep brown; subgenital plate with large, cordiform basal ring, pair of caudal arms straight and obliquely truncate at tip, and pair of minute sclerites between bases of caudal arms.

*Male*: Body length about 1.47 (1.39-1.57) mm. Wing about 0.87 mm. by 0.26 mm.

Head dark brown, with mouthparts brown, clypeus with eight or ten setae. Maxillary palp slender, with five segments in proportion of ? : 8 : 17.5 : 8 : 10. Antenna with scape dark brown, flagellum and plumose hairs dark brownish, last segment somewhat elongate oval, without terminal stylet, segments 2 to 10 and 11 to 14 in proportion of 90 : 86, distal eight segments in proportion of about 9 : 9 : 9 : 10.3 : 20 : 24 : 20 : 20.5.

Thorax with scutellum brownish yellow or yellowish brown, other dorsal sclerites dark brown or brownish black, pleural and sternal sclerites dark brown and slightly paler than scutum, scutellum with two lateral bristles and four median bristles and without or with small median accessory seta. Legs with coxae all dark brown, four basal tarsal segments pale brown, last tarsal segments brown; leg segments in proportion of about 89.3 : 84.7 : 46.2 : 18.7 : 15.8 : 12.2 : 12 in fore leg, 98.7 : 95.7 : 54 : 20.8 : 16. : 12.2 : 11.3 in middle leg, and 94.3 : 92.3 : 61.3 : 24.3 : 19.5 : 13.2 : 11.7 in hind leg.

Wing with costal and radial veins dark and second radial cell fuscous, macrotrichia very sparse, cell  $M_4$  with only two to four trichia and anal cell without trichia, bare area along veins broad. Venation: Costa ending slightly beyond middle of wing (35 : 67.3),  $R_s$  about 0.26 as long as  $R$  and 1.5 as long as  $R_1$  (7.7 : 20 : 5), first radial cell absent and second cell square and fuscous, stem of  $fMCu$  about 1.5 as long as  $R$  (29.7 : 20),  $fMCu$  under or slightly beyond tip of costal end. Haltere entirely brown.

Abdomen with dark or brownish black tergites, with minute hyaline dots at bases of setae but none on posterior segments, and no pale intersegmental bands. Hypopygium dark brown; sternite 9 transverse, with caudal median projection broadly triangular, chitinized at caudal tip, and ending between median lobes of aedeagus; chitinized tip of sternite 9 curved ventrad, then caudad, and ending bluntly or dilated laterad at extreme tip; tergite 9 rounded, little shorter than basal width, and with pair of small peg-like anal points. Coxite conical, about 1.5 times as long as basal width (22 : 14.8); style as long as coxite (22.5 : 22), very slightly curved, rather thick on basal half, slender on apical half, and very slightly incurved at pointed tip. Aedeagus triangular in outline, basal thickened edge transverse, somewhat W-shape, with pair of slender median lobes, convergent caudad and each with apical and preapical ventral tooth, and pair of shorter, broader lateral lobes three-dentate at caudal margin; parameres without median lobe, basal arms somewhat asymmetrical, sinistral arm somewhat larger than other, angulate, basal half or one-third slender and pointed basally, distal part rather broad and connected with bases of coxites.

*Female*: Body length about 1.2 mm. Wing about 0.68 mm. by 0.27 mm. Coloration somewhat different from that of male.

Head brown, with frons and mouthparts pale brown or pale brownish yellow, frontal tubercle somewhat rhombic; clypeus with eight to 11 setae. Maxillary palp pale yellow and with five segments in proportion of 3.5 : 6.5 : 12 : 5.5 : 8.5. Antenna with scape deep brown, flagellar segments brown; segments 5 to 13 tapered and segments 10 to 13 about twice as long as wide; last segment distinctly longer than penultimate, about 3.6 times as long as wide, somewhat pointed at tip, and without terminal stylet; distal eight segments in proportion of 9.5 : 9 : 9.4 : 10.6 : 10.8 : 10.9 : 10.9 : 18.3;  $AR$  about 0.85 (60.8 : 71.6).

Thorax with scutum deep brown but somewhat paler on lateral sides above wing bases; scutellum yellow, but brownish on lateral sides and with two large lateral bristles and four large median bristles and without small accessory setae; postscutellum dark brown, other pleural and sternal sclerites brown. Legs with coxae, articulations, and last tarsal segments brown; hind and middle femora broadly and obscurely brownish at middle and fore femur slightly brownish, other segments yellowish; leg segments from femora to last tarsal segments in proportion of 68.1 : 68.6 : 32.3 : 17.1 : 13.6 : 10.3 : 10.5 in fore leg, 80.4 : 80.5 : 37.5 : 17.6 : 14.3 : 10.4 : 10 in middle leg, and 77.8 : 76 : 46.8 : 21.6 : 15.8 : 11.4 : 10.6 in hind leg.



Wing with anal lobe obtuse, macrotrichia rather dense, bare areas along veins broad, cell  $M_4$  with 21 to 27 trichia and anal cell with many trichia on caudal half along anal margin, costal and radial veins brown. Venation: Costa ending just beyond middle of wing (26.5:51.9),  $R_s$  about 0.77 as long as  $R$  and 1.68 as long as  $R_1$  (9.4:12.2:5.6), first radial cell absent, second cell rather large, about 0.73 as long as stem, and its inner space rather large, stem of  $fMCu$  about 1.7 as long as  $R$ ,  $fMCu$  under tip of  $R_1$  and rarely under middle of second radial cell,  $Cu_1$  ending under costal end and rarely just beyond it. Haltere with stem brown and knob yellow.

Abdomen with tergites brown, without tergal pale punctures at bases of setae, sternite 1 reduced to a small transverse sclerite, 2 reduced to pair of small round sclerites, 3 to 5 to paired hemisternites, following subsquare, pleural and sternal membranes slightly dark brown; cerci brown; spermatheca deep brown, oval and 17.3 by 12 units; subgenital plate with basal ring large and cordiform, paired caudal arms rather long, straight, gradually broadened apically, obliquely truncate apically and very widely divergent in V-shape and pair of minute isolated sclerites between bases of arms.

**DISTRIBUTION:** Mariana Is., Caroline Is., Gilbert Is.

**S. MARIANA IS. SAIPAN:** Near Lake Susupe, male, Mar. 1945, Dybas; Afenia, male, May 1946, Townes; Naftan, four females, four males, June 1946, Townes.

**PALAU. NGAIANGL:** Four females, male, light trap, Dec. 1952, Gressitt. **BABELTHUAP:** Ngarabau, male, May 1957, Sabrosky; Ngaremlengui, male, June 1957, Sabrosky. **KOROR:** Male, light trap, May 1953, Beardsley. **ULEB-SEHEL:** Northwest part, 25 m., male, light trap, Dec. 1952, Gressitt. **PELELIU:** Male, sweeping, Jan. 1948, Dybas; north central part, male, Aug. 1945, Dybas; Mt. Amiangal, male, Dec. 1952, Gressitt.

**CAROLINE ATOLLS. ELATO:** Female, Feb. 1953, Beardsley.

**TRUK. TONOAS:** Female, Dec. 1935, Ono. **FEFAN:** Female, May 1946, Townes. **PIS:** Female, June 1946, Townes.

**PONAPE.** Mt. Temwetemwensekir, 180 m., female, Jan. 1953, Gressitt.

**GILBERT IS. TARAWA:** Naanikai I., male, Nov. 1957, Krauss.

This species is widely distributed in the Caroline Islands but rare in the other islands, being known only on Saipan. The original description and figure of the male hypopygium are inadequate and have been corrected above.

### 81. *Dasyhelea nigroris* Tokunaga and Murachi, n. sp. (fig. 64, a-c).

Rather small, dark-brown; last antennal segment without terminal stylet but somewhat pointed at tip; scutellum brown and with two large lateral bristles and four, or rarely three, large median bristles and without small median accessory setae; wing with second radial cells dark brown or brown; haltere entirely brown or with knob pale brown; femora broadly brownish on middle part. In male, style of hypopygium rather narrow, especially narrowed on preapical part, margin of aedeagal basal arch narrowly thickened, somewhat W-shape and aedeagal caudal lobes basally swollen and irregularly apically curved. In female,  $AR$  about 0.86, last antennal segment spindle-shape and with minute papilliform terminal projection, spermatheca subspherical, subgenital plate with basal ring rather slender, and subcordiform and caudal arms tapered, arcuate, arising separately from basal ring, caudal concavity between bases of arms U-shape.

*Male:* Body length about 1.3 mm. Wing about 0.85 mm. by 0.25 mm.

Head black, with mouthparts yellowish brown; clypeus with about five setae. Maxillary palp very pale yellow, with five segments in proportion of 3:5.3:12.8:5.9:8.3.

Antenna with scape black, flagellar segments and plumose hairs brown, each of distal four segments at least twice as long as preceding segments, ultimate segment longer than penultimate, rather pointed at tip, but without distinct terminal stylet; proportion of segments 2 to 10 and 11 to 14 about 93.3:86.3; distal eight segments in proportion of 9.8:9.1:9.6:9.6:18.5:22.3:21.1:24.9.

Thorax dark brown; scutellum brown, with two large lateral bristles and four large median bristles and without small accessory setae. Legs with coxae brown; in fore leg trochanter pale brown, femur pale brown at both ends, broadly brown on middle part, knee joint dark, tibia entirely pale brown, four basal tarsal segments yellowish pale brown, last tarsal segment brown; middle leg as in fore; in hind leg trochanter brown, but apically pale brown, tibia mainly brown and sub-basally pale brown, other segments as in fore leg; leg segments, except for basal two, in proportion of 78:79.3:36.4:19:16.1:12.1:11 in fore leg, 92.4:90:46.6:19.8:15.1:11.3:10.5 in middle leg, and 83.8:87:52.8:22.9:17.3:12.3:11.1 in hind leg.

Wing with macrotrichia rather sparse, cell  $M_4$  with about ten (10-13) trichia and anal cell with 15 to 30 trichia on caudal area, costal and radial veins dark brown or brown. Venation: Costa ending at middle of wing (31:61.8),  $R_s$  rather short, about 0.43 as long as  $R$ , and about 1.55 as long as  $R_1$  (7.6:17.6:4.9), first radial cell absent, second cell square, dark brown, about two-thirds as long as stem (11:18.3), stem of fMCu about 1.6 as long as  $R$  (28.1:17.6), fMCu just under or slightly beyond costal end. Haltere entirely brown.

Abdomen with dorsal side dark brown, sternites 6 to 8 also dark brown, membranous areas brown, tergal pale punctures at bases of setae very small and indistinct. Hypopygium black; sternite 9 transverse and median caudal projection obscure; tergite 9 trapezoid, and with anal points clavate. Coxite rather small, conical, about 1.48 as long as basal width (20.2:13.7); style as long as coxite (20.9:20.2), almost straight, tapered but apically thickened, and truncate at tip. Aedeagus with basal arch very slender and somewhat W-shape, its two caudal lobes rather large, rather slender and rather irregularly curved apically, and distinctly swollen basally; parameres with medial lobe rather short, stout, about 0.78 as long as coxites (14.3:20.2) and truncate apically; basal arms rather short, broad, and angulate.

*Female:* Body about 1.18 mm. Wing about 0.69 mm. by 0.28 mm. Coloration generally similar to that of male.

Head dark brown, with mouthparts pale brown, eyes very narrowly separated above, frontal tubercle somewhat oval; clypeus with ten or 11 setae. Maxillary palp very pale brown, with five segments in proportion of 5:5.3:12.4:5.5:8.2. Antenna with distal segments 10 to 13 distinctly longer than preceding and twice as long as basal width, segments 3 to 9 subspherical to short oval, last segment about three times or more as long as wide, with papilliform tip; AR about 0.86 (62:72); proportion of distal eight segments about 9:8.7:9.2:10.5:11:10.7:11.2:18.7.

Thorax almost entirely dark brown or brown, but scutellum yellowish or paler and with two large lateral and four large median bristles and without small accessory setae. Legs mainly yellowish pale brown, but coxae, last tarsal segments, and apical two-thirds of hind femur more brownish; leg segments, except for coxae and trochanters, about 71.3:70.7:34.3:17:13.8:11.2:10.3 in fore leg, 81.5:85.5:39.5:18.5:15:11:10 in middle leg, and 78:77.3:48:21.7:16.2:11.5:11.3 in hind leg.

Wing with costal and radial veins fuscous or brownish, costal and radial cells brownish, anal lobe somewhat obtuse, macrotrichia on membrane rather sparse, cell  $M_4$  with about 25 to 40 trichia, anal cell hairy on caudal half, bare areas along veins distinct. Venation: Costa ending just beyond middle of wing (27.3:52.6),  $R_s$  about 0.74 as long as  $R$  and about 1.8 as long as  $R_1$  (9.3:12.5:5.2), first radial cell absent, second cell rather long, about three-fourths of stem (15:21), and its inner space very narrow, stem of fMCu about 1.68 as long as  $R$  (21:12.5), fMCu under tip of  $R_1$  or more or less beyond it and sometimes under middle of second radial cell, tip of  $Cu_1$  under or just beyond costal tip. Haltere with stem brown, knob brown or pale brown on apical half and yellow or pale brownish yellow on basal half.

Abdomen with tergites dark brown, sternites reduced to small paired sclerites and pale brown, pleural membranes dark or fuscous brown; tergites with indistinct pale-brown punctures at bases of setae; cerci brown; spermatheca brown, small, subspherical, about 18.7 by 16.3 units, with very short chitinized duct; subgenital plate with large, subcordate basal ring and pair of caudal arms arising directly from basal ring with broad bases, widely divergent, tapered, arcuate, and curved apically, tips slender.

Holotype, male (US 64041), Mt. Chukumong, Wena I., Truk, 180 m., Feb. 1, 1953, Gressitt. Allotype, female (BISHOP 2596), Mt. Temwetem-wensekir, Ponape, 180 m., Jan. 16-19, 1953, Gressitt. Paratypes: Female, Pt. Oca, Guam, Mariana Is., June 2, 1945, Dybas. Ponape, female, Colonia, June-Sept. 1950, Adams; female, male, airfield, June-Sept. 1950, Adams; female (BISHOP), Agric. Exper. Sta., Colonia, Jan. 11, 1953, Gressitt; eight females, three males, same data as for allotype; male, Nanpohnmal, 50 m., Jan. 29, 1953, Gressitt.

DISTRIBUTION: Caroline Is., Mariana Is.

This species is somewhat allied to *D. insularis* and *D. peliliouensis*. However, in *insularis*, the following points are different from this species: In the male, TR of the fore leg is only about 1.92 and at most about 2.05, and the male hypopygium is distinctly different as shown in the key; in the female, the spermatheca is rather smaller, about 17.8 by 12 units, and suboval, and the subgenital plate has a pair of minute additional sclerites between the bases of the caudal arms. *D. peliliouensis*, except for the specific structure of the male hypopygium, differs from this species in the following points: In the male, the ultimate antennal segment is far shorter than the penultimate (19.1:26.8), and the scutellum is yellowish; in the female, the ultimate antennal segment is about 1.3 as long as the penultimate and sternites 3 to 7 are subsquare.

## 82. *Dasyhelea peliliouensis* Tokunaga (fig. 64, *d-h*).

*Dasyhelea peliliouensis* Tokunaga, 1940, Tenthredo 3 (2): 177 (Palau); 1941, Annot. Zool. Japon. 20 (2): 112 (Truk).

Small or medium size, brown; antenna without terminal stylet; scutellum yellowish pale brown or yellow and with four, and very rarely three or five, large median bristles and without small accessory setae; legs with coxae and last tarsal segments slightly fuscous pale brown, tibiae somewhat paler and four basal tarsal segments much paler brown, femora somewhat brownish, especially in middle and hind legs; wing with macrotrichia rather sparse in male and rather dense in female; abdomen with pale tergal punctures at bases of setae in female. In male, style of hypopygium rather long, basal half rather thickened, and apical half tapered; aedeagus triangular, with basal chitinized bar very slightly arcuate, and aedeagal paired lobes arising from lateral ends of bar, tapered, and almost straight; parameres asymmetrical, median lobe very unequally bifurcate distally, basal arms broad and irregular in shape. In female, antennal segments 6 to 13 more or less elongate and cylindrical and last segments about 1.28 times as long as preceding one but less than 1.4 times; sternites 3 to 7 subsquare; subgenital plate with large, cordiform basal ring and U-shape caudal concavity between arms.

*Male*: Body about 1.43 (1.29-1.55) mm. long. Wing about 0.86 mm. by 0.28 mm.

Head brown, with frons and mouthparts pale brown; clypeus with about eight (7 to 11) setae. Maxillary palp very pale brown, with five segments in proportion of about

5:7:13.4:7.4:9.4. Antenna with scape brown, flagellar segments and plumose hairs pale brown; proportion of segments 2 to 10 and 11 to 14 about 105.7:92; distal eight segments in proportion of 10.2:10.3:10.4:10.7:19.8:26.5:26.8:19.1; last segment without terminal stylet.

Thorax almost entirely brown, but scutellum yellow or yellowish pale brown, scutum without paler or yellowish spots; scutellum with two large lateral and four, or rarely five, large median bristles and without small accessory setae. Legs with coxae, trochanters, femora, and last tarsal segments somewhat fuscous brown, tibiae slightly paler than femora, four basal tarsal segments very pale brownish hyaline; leg segments, except for basal two, in proportion of 87.6:92.4:41:19.4:15.9:14:12 in fore leg, 100.4:100.3:62.8:21.6:16.9:13.6:11.6 in middle leg, and 95.5:96.6:57.9:26.2:20.8:14.4:11.5 in hind leg.

Wing with costal and radial veins pale brown, macrotrichia rather sparse, bare areas along veins broad, cell  $M_4$  with four to seven trichia. Venation: Costa ending slightly beyond middle of wing (34.8:66.2),  $R_s$  about half as long as  $R$  and about 1.5 as long as  $R_1$  (9.3:18.8:6.1), first radial cell absent, second cell somewhat obscure and sometimes incomplete, subsquare, and half as long as stem (3:6.1), stem of  $fMCu$  about 1.66 as long as  $R$  (31.1:18.8),  $fMCu$  more or less beyond costal end. Haltere with stem brown and knob pale brown, yellowish pale brown, or pale yellow.

Abdomen with tergites uniformly brown, without tergal pale punctures at bases of setae and intersegmental pale bands, pleural and sternal membranes slightly fuscous. Hypopygium with sternite 9 extended between bases of coxites to base of aedeagus; tergite 9 rather long, tapered, trapezoid, slightly shorter than basal width, and with pair of rather slender and clavate anal points. Coxite conical, subtriangular in ventral aspect, about 1.47 as long as basal width (23:15.6) and little longer than style (23:21); style almost straight or very slightly arcuate, basal half pubescent and rather thick, and apical half tapered, bare, and with incurved tips. Aedeagus subtriangular, with basal bar rather broad and very slightly arcuate, paired chitinized lobes arising from ends of basal bar, tapered, somewhat pointed, and convergent apically; parameres asymmetrical, with median lobe long, fully as long as styles (21.8:21), broadened before middle, very slender, and sharply pointed on apical half, and with small sharp lobe before middle; basal arms broad, yellowish, pointed at both ends, sinistral arm slightly, and dextral arm strongly, curved.

*Female:* Body about 1.32 mm. Wing about 0.73 mm. by 0.28 mm. Coloration closely similar to that of male.

Head brown, with eyes narrowly separated above as wide as a facet, labrum brown, labella and palp very pale brownish hyaline, frontal tubercle subrhombic; clypeus with seven to ten setae. Maxillary palp with five segments in proportion of 3.7:7.3:13.7:7:8.3. Antenna rather long, basal flagellar segments 3 to 5 more or less longer than wide, 6 to 13 about twice as long as wide and cylindrical, segments 9 to 13 increasing in length distad, ultimate segment shorter than 1.4 times and about 1.3 times as long as preceding segment, apically somewhat pointed, and without terminal stylet;  $AR$  about 0.8 (0.79-0.82, 67.1:83.9); proportion of distal eight segments about 10.7:10.7:10.7:11.8:12:12.7:13.1:16.7.

Thorax mainly brown; scutum somewhat paler or yellowish on lateral sides or caudal half above wing bases; scutellum yellow, but lateral corners brownish and with two large lateral and four, or very rarely three, large median bristles and without small accessory setae. Legs with coxae, fifth tarsal segments and articulations brown, other segments mainly pale brownish yellow, but middle and hind femora more broadly brownish on middle part; proportion of leg segments from femora to tarsi about 74.2:75.2:35.8:17.2:14.6:12:11.4 in fore leg, 91:91:52.4:18.8:15.3:11.9:11 in middle leg, and 85.8:81.6:50.8:22.6:18.1:12.2:10.8 in hind leg.

Wing with anal lobes round, costal and radial veins pale brown, macrotrichia rather dense, but bare areas along veins broad, cell  $M_4$  with 16 to 25 trichia on membrane and anal cell with many trichia on caudal half along marginal area. Venation: Costa ending little beyond middle of wing (30.4:56.8),  $R_s$  about 0.72 as long as  $R$  and about 1.57 as

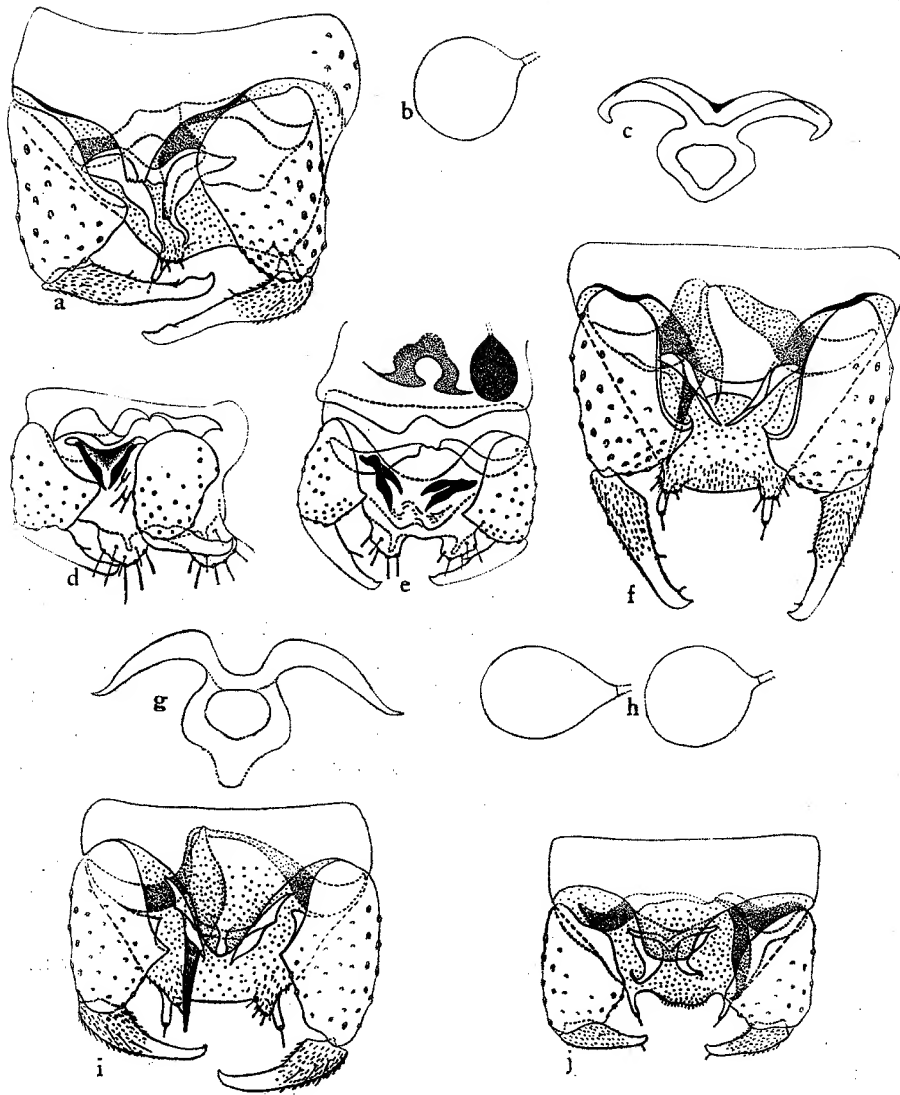


FIGURE 64.—a-c, *Dasyhelea nigroris*: a, hypopygium, male; b, spermatheca; c, subgenital plate. d, e, *D. peliliouensis* (intersexual forms), hypopygium, male: d, specimen from Ponape I.; e, specimen from Palau Is. f-h, *D. peliliouensis*: f, hypopygium, male; g, subgenital plate; h, two forms of spermathecae. i, *D. insulicola*, hypopygium, male. j, *D. fumala*, hypopygium, male.

long as  $R_1$  (9.9:13.8:6.3), first radial cell absent, second cell about 0.6 as long as stem (14.5:24.3), stem of fMCu about 1.7 as long as R (23.5:13.8), fMCu under tip of  $R_1$  and  $Cu_1$  ending under or just beyond costal end. Haltere with stem brown and knob yellow.

Abdomen with tergites brown, sternites 1 and 2 highly reduced; that of 1 to small transverse sclerites, those of following segments not reduced, but subsquare and brown; pleural and sternal membranes slightly dark brown; tergites with many minute pale punctures at bases of setae; cerci pale brown; spermatheca brown but apical part yellowish, without chitinized duct, short oval, small, and about 14.8 by 10.6 units; subgenital plate with large cordiform basal ring which bears rather broad basal projection and pair of slender caudal arms, arising from caudal part of basal ring, extending caudad, and then curving laterad to form large U-shape concavity between bases of arms.

DISTRIBUTION: S. Mariana Is., Caroline Is., Marshall Is., Gilbert Is.

S. MARIANA IS. SAIPAN: Mt. Tagpochau, NNE of summit, female, Jan. 1945, Dybas; As Mahetog area, three females, three males, sweeping air, Feb. 1945, Dybas; five females, five males, at light, May 1945, Dybas; Chalan Kanoa, Jan. 1949, Maehler. TINIAN: Marpo Valley, female, Oct. 1945, Dybas. GUAM: Oca Pt., female, light trap, June 1945, G. Bohart and Gressitt; Com. Mar. Hill, two males, May 1949, Maehler; Yigo, female, Oct. 1957, Krauss.

PALAU. BABELTHUAP: Ngerhelong Pen., two females, May 1957, Sabrosky; Ulimang, two females, Dec. 1947, Dybas; Ngaremlengui, female, male, light trap, Apr. 1957, ten females, 15 males, light trap, June 1957, Sabrosky. KOROR: Three females, Sept. 1952, Beardsley; four females, five males, light trap, Dec. 1952, Gressitt; female, male, Apr., May 1953, Beardsley; female, Mar. 1954, Beardsley; 16 females, 13 males, light trap, Apr., May 1957, three females, seven males, light trap, July 1957, Sabrosky; southwest part, 25 m., female, three males, light trap, Dec. 1952, Gressitt. PELELIU: Two males, at light, sweeping air, July 1945, Dybas; female, male, Aug. 1945, Dybas. ANGAUR: Two females, Feb. 1948, male, Feb. 1947, Dybas; five males, Feb. 1957, Sabrosky.

YAP. YAP: Female, male, July-Aug. 1950, Goss; Hill, Yaptown, male, Dec. 1952, Gressitt; south Yap I., female, two males, July-Aug. 1950, Goss. MAP: Male, Aug. 1950, Goss.

CAROLINE ATOLLS. ULITHI: Fassarai I., female, Aug. 1946, Townes. KAPINGAMARANGI: Werua I., male, July 1954, Niering.

TRUK. PIS: Female, two males, June 1946, Townes.

PONAPE. Colonia, 12 females, four males, June 1950, Adams.

KUSAIE. Mutunlik, two males, Jan. 1953, Gressitt.

MARSHALL IS. ENIWETOK: Jobtan I., two males, Aug. 1956, Tuthill. JALUIT: Imroj I., female, male, Aug. 1946, Townes; Mejetto I., three females, two males, Aug. 1946, Townes; Sydney Pier, three females, three males, Aug. 1946, Townes; Majurirok I., female, Apr. 1958, Gressitt. LIKIEP: Likiep I., 25 females, 15 males, Aug. 1946, Townes. MAJURO: Five females, male, Aug. 1946, Townes; Ulika I., two females, three males, Aug. 1946, Townes; female,

four males, June 1950, La Rivers. ARNO: Ine I., three females, Jan. 1950, female, June 1950, La Rivers.

GILBERT IS. MARAKEI: Seven females, male, Dec. 1957, Krauss. BUTARITARI: Butaritari I., eight females, four males, Dec. 1957, Krauss. TARAWA: Bikenibeu I., 12 females, six males, Bairiki I., two females, five males, Taborio I., female, Betio I., eight females, seven males, Teaoraereke I., female, two males, Eret I., four females, ten males, Nov.-Dec. 1957, all Krauss.

***Dasyhelea peliliouensis***, intersexual form (gynandromorph).

Several specimens seem to be an intersexual form of *D. peliliouensis*, judging from the unusual shape of the wings and antennae. At present, I have two intersexual specimens which are provided with both sexual organs.

Non-sexual organs of the specimen from Ponape, such as antennae, wings, and anterior abdominal segments, show female characters and the abdomen contains several well-developed eggs. However, its genital organs are more similar to those of the male, being provided with well-developed coxites and styles, small aedeagus, and incomplete parameres. The spermatheca and subgenital plate of the female sexual organs are completely atrophied, but the pair of cerci retain normal female size.

In another intersexual specimen, from Babelthuap Island, Palau Islands, the non-sexual organs are very similar to those of the male, but sexual organs are provided with well-developed spermatheca, incompletely developed subgenital plate and sternite 8, and slightly smaller cerci than the female organs. The male genital organs are better developed, but the aedeagus is not perfect, being subdivided into paired sclerites, and the parameres are devoid of the caudal median lobe.

DISTRIBUTION: S. Mariana Is., Caroline Is.

S. MARIANA IS. ROTA: One, June 1946, Townes.

PALAU. BABELTHUAP: Ngaremlengui, one, June 1957, Sabrosky.

PONAPE. Colonia, one, June 1950, Adams.

**83. *Dasyhelea insulicola* Tokunaga and Murachi, n. sp. (fig. 64, i).**

Medium size, brown; antenna with last segment rather round at tip; scutum almost entirely brown, but with obscure pale areas or stripes, scutellum yellow with four large median bristles. In male, abdomen without pale punctures at bases of tergal setae, hypopygium closely similar to that of *D. peliliouensis*, but aedeagus with basal bar between paired lobes situated slightly caudad of aedeagus, sternite 9 with minute dark sclerite at tip of caudal expansion, parameres with median lobe simple, and basal arms rather slender.

*Male*: Body about 1.5 mm. long. Wing about 0.7 mm. by 0.26 mm.

Head dark brown, with mouthparts pale brown, eyes just contiguous above, frontal tubercle small and oval; clypeus with only four setae. Maxillary palp pale brownish hyaline, with last segment oval and five segments in proportion of 4:6.5:13:7.5:8. Antenna with scape dark brown, flagellar segments and plumose hairs brown, last segment without terminal stylet; proportion of segments 2 to 10 and 11 to 14 about 75:59; distal eight segments about 7:7:7.5:7.5:13:16.5:14:15.

Thorax: Scutum almost entirely brown, but with pale-brown, obscure stripes along foveae, humeral parts, caudal half of lateral margins above wing bases, and caudoscuteal area paler; scutellum yellow, with two large lateral and four large median bristles and without small accessory setae; other sclerites brown. Legs with coxae and trochanters as brown as thoracic pleurites, femora little paler than coxae and yellowish pale brown, tibiae much paler and yellowish very pale brown, tarsi pale brownish hyaline, knee joints brown; legs with seven distal segments in proportion of 78:76:36:16:15:12:11.5 in fore leg, 90:89:44:18:15.5:12:12 in middle leg, and 86:81:52:21:16:13:12 in hind leg.

Wing with macrotrichia rather dense, cell  $M_4$  with about 17 trichia and anal cell with about 34 trichia on caudal half along anal margin, anal lobe obtuse, costal and radial veins pale brown. Venation: Costa slightly beyond middle of wing (27:49),  $R_s$  rather short and about half as long as  $R$  (7:14.5) and 1.75 as long as  $R_1$ , first radial cell absent, second cell about 0.56 as long as stem (10:18), stem of fMCu about 1.76 as long as  $R$  (25.5:14.5), fMCu slightly beyond costal end. Haltere with knob yellow.

Abdomen with tergites brown, sternites and pleural membranes pale brown, pale punctures at bases of tergal setae absent. Hypopygium with sternite 9 transverse, caudal expansion broad, beyond basal bar of aedeagus, round and membranous at tip, and with minute, dark-brown sclerite on apical part between caudal lobes of aedeagus; tergite 9 very broad, round at tip, about 0.63 as long as basal width (27:43), and with pair of slender anal points. Coxite subtriangular in ventral aspect and about 1.8 as long as wide; style tapered, arcuate, pointed and incurved at tip, and about 0.78 as long as coxite. Aedeagus consisting of slender sclerites, with basal bar located slightly caudad beyond middle and paired lateral lobes almost straight, pointed at both ends, and distinctly convergent caudad; parameres with median lobe longer than coxite (27:25), broad at basal one-third, tapered and sharply pointed on apical half, basal arms rather slender on basal half and somewhat broadened on apical half, asymmetrical, dextral arm longer and more slightly curved than sinistral.

*Female:* Unknown.

Holotype, male (US 64042), Majuro Atoll, Marshall Is., Aug. 28, 1946, Townes.

Other specimens, male, Koror, Palau Is., July 21, 1957, Sabrosky; male, Dugor Distr., Yap, May 14, 1957, Sabrosky.

DISTRIBUTION: Marshall Is. (Majuro), Caroline Is. (Palau, Yap).

This species is closely allied to *D. peliliouensis*, but the two species are distinctly different in the following points. In this species, the three distal antennal segments are subequal in length, the scutum has a somewhat pale-brown caudoscuteal area, sternite 9 has a minute, dark-brown isolated sclerite on its caudal projection, the basal bar of the aedeagus is located beyond the middle of the aedeagus and connected with the paired slender caudal lobes at their middle part, the median lobe of the parameres is simple, and the basal arms of the parameres are rather more slender. In *D. peliliouensis*, the ultimate antennal segment is much shorter than either of the preceding two segments, the scutum is almost entirely dark brown or brown, sternite 9 has no minute isolated sclerites on its caudal projection, the basal bar of the aedeagus is located at the base of the aedeagus and connected with the paired caudal lobes at their bases, the median lobe of the parameres has a short, sharply pointed projection before the middle, and the basal arms of the parameres are rather broad. The species is named in relation to its distribution.



84. *Dasyhelea fumala* Tokunaga (fig. 64, j).

*Dasyhelea fumala* Tokunaga, 1940, *Tenthredo* 3 (2): 176 (Palau).

Small or medium size, black or dark brown; antenna without terminal stylet; scutellum and haltere dark brown as in other parts of thorax; scutellum with only two large median bristles (specimens from Guam often with four median and two lateral) and without small accessory setae; legs with coxae, trochanters, femora, tibiae, and last tarsal segments more or less fuscous brown; wing with anterior veins dark or fuscous, macrotrichia sparse, and bare areas along veins broad and distinct. Male wing without macrotrichia in wing cell  $M_4$  and anal cell, hypopygium with aedeagus small, aedeagal basal bar very shallowly V-shape and its lateral paired lobes strongly curved laterad at tip, parameres with slender median lobe and basal arms. Female wing entirely faintly fumose, and spermatheca round with very short chitinized duct.

*Male*: Body about 1.43 mm. long. Wing about 0.81 mm. by 0.26 mm.

Head dark brown, with mouthparts brown; clypeus with about eight (7-9) setae. Maxillary palp with five segments in proportion of 3.3:6.2:15.1:7.3:9.4. Antenna with scape black, flagellar segments and plumose hairs dark brown or deep brown, last segment without terminal stylet; proportion of segments 2 to 10 and 11 to 14 about 94.6:80.8; distal eight segments in proportion of 9.6:9.3:9.4:9.3:18.3:22.3:20.5:19.6.

Thorax entirely dark or dark brown, including scutellum and pleural sides; scutellum with two large lateral and two large median bristles and without small accessory setae. Legs brownish fuscous, except for paler four basal tarsal segments; proportion of leg segments, except for basal two, about 82.4:76.8:35.6:16.2:14.1:12.4:11.8 in fore leg, 95.8:88.8:45.9:18:14.7:12.2:11.6 in middle leg, and 86.4:83.4:47.5:21.1:16.8:13:11.6 in hind leg.

Wing with costal and radial veins fuscous, macrotrichia very sparse, cell  $M_4$  and anal cell without trichia. Venation: Costa ending just beyond middle of wing (32.8:63),  $R_s$  short, shorter than half of  $R$  (8.4:18.2) and about 1.7 as long as  $R_1$  (8.4:4.9), first radial cell absent, second cell little shorter than stem (3.4:4.1) and often incomplete, stem of fMCu about 1.65 as long as  $R$  (30:18.2), fMCu more or less beyond tip of costa. Haltere entirely dark brown or brown.

Abdomen with tergites entirely dark brown, sternites not reduced to paired hemisternites, pleural and sternal membranes fuscous. Hypopygium dark; sternite 9 transverse, its median part slightly produced caudad beneath aedeagus forming small subsquare lobe, not extending beyond aedeagus; tergite 9 rather short, about half as long as basal width, somewhat triangular, but with caudal margin rounded and anal points slender and slightly clavate. Coxite conical, short, broad at base, and about 1.5 as long as wide; stylet rather stout, tapered, slightly arcuate, as long as basal width of coxite, and obliquely truncate at tip. Aedeagus small, with basal bar somewhat shallowly V-shape, paired lateral lobes broad on basal half or two-thirds, pointed, and strongly curved laterad apically; parameres asymmetrical, with median lobe rather slender, pointed sharply, and fully as long as style (16.6:15.3), basal arms not very broad, sinistral longer and less undulate than dextral.

*Female*: Body length about 1.22 (1.09-1.49) mm. Wing about 0.71 mm. by 0.28 mm.

Coloration closely similar to that of male or somewhat darker.

Head with eyes very narrowly separated above, frontal tubercle subrhombic; clypeus with usually eight and rarely seven setae. Maxillary palp brownish, rather slender, with five segments in proportion of 3.7:5.7:13.8:6.8:8.7. Antenna with flagellar segments, except for basal and distal ones, almost similar to each other, being oval and barely twice as long as basal width; ultimate segment oval, with distal end blunt and without terminal stylet; AR about 0.71 (51:72); distal eight segments in proportion of 9.3:9:9.3:9.8:10:9.5:9.3:12.5.

Thorax entirely dark brown including scutellum; scutellum with two large lateral and two large median bristles and without small median accessory setae. Legs with coxae, trochanters, femora, tibiae, and last tarsal segments uniformly dark brown or brown, four basal tarsal segments pale brown or yellowish brown; proportion of leg segments,

except for basal two, about 68.8:65.3:31.1:13.5:11.8:10:10 in fore leg, 82.8:80:38.8:15.6:12.3:11.1:10.6 in middle leg, and 77.1:73:39.9:15.6:13.1:11.5:10.1 in hind leg.

Wing entirely pale fuscous, with costal and radial veins dark, costal and second radial cell somewhat fuscous, macrotrichia rather sparse, cell  $M_4$  with about 17 (12-20) trichia and anal cell with 30 or 40 trichia on marginal area, bare areas along veins distinct and broad, anal lobe obtuse. Venation: Costa slightly beyond middle of wing (28.6:52.1),  $R_s$  about 0.65 as long as  $R$  and about 1.76 as long as  $R_1$  (8.8:13.6:5), first radial cell absent, second cell somewhat square and its inner space narrow, stem of  $fMCu$  about 1.6 as long as  $R$ ,  $fMCu$  usually under tip of  $R_1$  and rarely slightly beyond it,  $Cu_1$  ending under tip of  $R_s$ . Haltere dark brown or brown.

Abdomen with tergites dark brown or deep brown, sternites subsquare and brown, lateral membranes dark; tergites with many pale-brown punctures at bases of setae; intersegmental bands yellowish and very narrow; cerci dark brown; spermatheca subspherical or round, brown, with short chitinized duct and theca about 13 by 16.7 units; subgenital plate with basal median ring very large, cordiform, lateral arms convergent basally, forming small, caudal median concavity, then curved laterad along caudal margin of sternite 8.

DISTRIBUTION: S. Mariana Is., Caroline Is., Marshall Is.

S. MARIANA IS. GUAM: Yigo, 14 females, 42 males, Oct. 1957, Krauss.

YAP. YAP: Yaptown, male, July 1946, Townes.

CAROLINE ATOLLS. KAPINGAMARANGI: Hare I., male, allotype, Aug. 1946, Townes; male, female, same data as for allotype. MOKIL: Female, Jan. 1953, Gressitt. PINGELAP: Female, Jan. 1953, Gressitt.

PONAPE. Mt. Temwetemwensekir, 180 m., female, Jan. 1953, Gressitt.

KUSAIE. Mutunlik, female, Feb. 6, 1953, Clarke.

MARSHALL IS. JALUIT: Sydney Pier, three males, Aug. 1946, Townes.

ARNO: Female, four males, June 1950, La Rivers.

# **85. *Dasyhelea nigripygma* Tokunaga, n. sp. (fig. 65).**

Small, dark brown, with peculiar aedeagus, scutum entirely dark brown, scutellum brown, with four large median bristles and two small accessory setae; antennal flagellar segments short and oval, last antennal segment oval, about twice as long as wide, and without terminal stylet, abdominal sternites of segments 3 and 4 subdivided into paired hemisternites, following two sternites partially atrophied but subsquare; subgenital plate with basal ring subcordiform and caudal arms divergent caudad in U-shape; spermatheca probably subspherical.

*Male*: Body about 1.42 mm. long. Wing about 0.81 mm. by 0.26 mm. General coloration very dark.

Head dark brown, with mouthparts yellowish brown, eyes just contiguous above, proboscis about one-third length of head capsule, clypeus with four or five setae on either lateral side. Maxillary palp yellowish brown, rather slender, with about four spoon-like sensillae on basal part of segment 3, five segments in proportion of 5:7:13:8:8. Antenna entirely brown, flagellar segments with basal striation before verticils, last segment oval, much broader than preceding ones and with faint reticulation, penultimate three segments with double nodes; relative length of distal eight segments about 7.5:7.5:8:8:16:18:16:16; combined proportional length of segments 2 to 10 and 11 to 14 about 81:68.5.

Thorax almost entirely dark, but scutellum yellowish fuscous and with four median bristles and central small seta in addition to two lateral bristles. Legs extensively dark, with knee joints black, tarsi yellowish, hind tibial comb with five apical bristles; claws slightly bifid only at extreme apices; relative length of leg segments, except for basal two, about 86:84:46:17:15.5:12:15 in fore, 95:94:50:20:16.5:11:15 in middle, and 93:86:53:?:?:?:? in hind leg.

Wing with anterior veins dark, macrotrichia rather sparse, but anal cell and  $M_4$  cell with macrotrichia along anal margin. Venation: Costa ending before middle of wing (30.5:62.5) and far before level of fMCu, R, M and stem of fMCu in proportion of 18:15:28.  $R_s$  very short, shorter than half of R (8:18), about 1.6 times of  $R_1$  (8:5) and squarely ending on costal end, second radial cell about half as long as its stem vein (2.2:4.5) and with inner space oval,  $Cu_1$  meeting anal margin with 90-degree angle and about 0.4 as long as  $M_{3+4}$  (6:16). Haltere fuscous brown and with central yellowish spot on knob.

Abdomen dark, hypopygium with tergite 9 semicircular and with pair of small anal points; sternite 9 about half as long as the tergite and transverse; coxites with bases very broad and strongly chitinized basal rims; styles distinctly shorter than coxites (21:25), tapered, curved and pointed apically. Aedeagus rather broad, with basal arch strongly chitinized, lateral basal parts triangular, pair of lateral caudal processes armed with apical ax-like chitinizations and median caudal lobe rather long, somewhat sagittiform, with small apical concavity and sub-basal process produced ventrad; parameres almost symmetrical, with mesal parts slender, lateral parts rather broader; median lobe of parameres obscure, but apparently present.

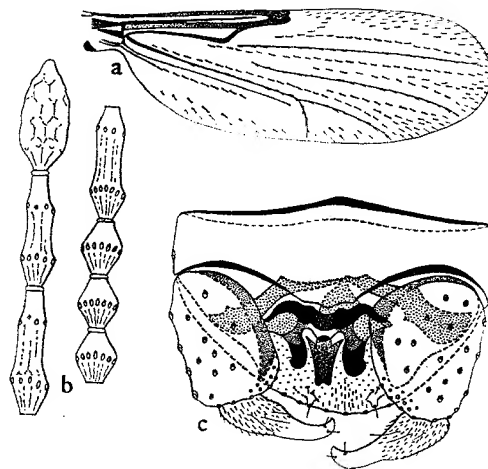


FIGURE 65.—*Dasyhelea nigripygma*, male: a, wing; b, distal seven flagellar antennal segments; c, hypopygium.

*Female*: Body length about 1.35 mm. Wing about 0.75 mm. by 0.26 mm. General structure somewhat similar to that of *D. quarternhamata* and *D. peliliouensis*.

Head dark brown, with labellum and palp pale brown; clypeus with about 12 setae. Maxillary palp rather slender and with five segments in proportion of ?:6:14:7:9. Antenna with scape dark brown, flagellar segments brown and short oval, ultimate segment also oval, twice as long as wide, and round at tip; AR about 0.83 (57:69); distal eight segments in proportion of 8.5:8.5:8:9.5:10.5:10:10.5:16.

Thorax dark brown, but scutellum brown, with two large lateral and four large median bristles and two small accessory setae. Legs with coxae, trochanters, femora, tibiae, and last tarsal segments brown, but fore and middle tibiae somewhat paler, four basal tarsal segments very pale brown; proportion of distal seven segments about 77:74:41:17:14:11:11 in fore leg, 89:89:47:18.5:15.5:12:12 in middle leg, and 88:85:58:24:19:13:12.5 in hind leg.

Wing with macrotrichia rather dense, cell  $M_4$  with 34 trichia on membrane and anal cell with many trichia on caudal half, costal and radial veins dark brown. Venation: Costa

slightly beyond middle of wing (29:55), Rs about two-thirds as long as R and 1.67 as long as  $R_1$  (10:15.6), first radial cell absent, second cell rather large, about half as long as stem (13:25), stem of fMCu about 1.47 as long as R (22:15), fMCu under tip of  $R_1$  and tip of  $Cu_1$  under costal end. Haltere entirely brown.

Abdomen with tergites and pleural membranes dark brown, sternites of segments 3 and 4 reduced and subdivided into paired hemisternites, following two sternites partially reduced but subsquare; intersegmental pale bands and tergal brownish punctures at bases of setae indistinct; cerci brown; spermatheca brown, probably subspherical, and about 12 by 10 units; subgenital plate with basal ring large and subcordiform, caudal arms rather widely separated at bases, arcuate, tapered, and widely divergent caudad in U-shape.

Holotype, male (BISHOP 2756), Mutunlik, 22 m., Kusaie I., Jan. 24, 1953, light trap, Gressitt. Allotype (US 64608), female, southwest Koror I., Palau Is., Dec. 17, 1952, 25 m., Gressitt. Paratypes, Palau: Female (US, BISHOP), Koror, May 2, 1957, Sabrosky; female, Malakal I., May 2, 1957, Sabrosky; female, Ngaiangl A., Dec. 15, 1952, light trap, Gressitt.

DISTRIBUTION: Caroline Is. (Palau).

This species is somewhat allied to *D. quarternihamata* and *D. peliliouensis*. However, in *quarternihamata*, the scutellum has no small accessory setae, the caudal arms of the subgenital plate are very broad at bases, and the basal ring of the plate is oval. In *peliliouensis*, the general coloration is much paler, the scutellum and the knobs of the halteres are all yellowish, the antennae are slender, the distal eight segments are rather long and cylindrical, and the ultimate segment is rather pointed at tip, the scutellum has no small accessory setae, sternite 3 and following segments are all subsquare and not reduced to paired hemisternites and the basal ring of subgenital plate has a rather large anterior expansion. The male is allied to *D. insularis* in the structure of the aedeagus, but the apical appendages of the lateral caudal lobes are very slender in *insularis*, differing from those of *nigripygma*.

#### 86. *Dasyhelea striipennis* Tokunaga, n. sp. (fig. 66).

Brownish, small; scutum with faint pale stripes along foveae and similar spots on lateral sides above wing bases, legs very pale, with knee joints somewhat fuscous. Antenna with last segment unusually large, being twice as long as penultimate in both sexes, female flagellar segments from 10 to 13 not differentiated from preceding ones. Scutellum with four median bristles. Legs largely very pale, with knee joints more or less dark, hind TR about 2.7 in male and 2.84 in female. Abdomen with pale spots at bases of tergal setae, sternites reduced into hemisternites on segments 3 to 5. Wing with Rs rather long, subequal to R in female and about 0.7 of R in male, costa ending well beyond middle of wing, second radial cell subtriangular, small and shorter than half of its stem vein. Male hypopygium similar to that of *D. perfida* Johannsen, but styles almost straight in contrast to the allied species. Female subgenital plate and spermatheca resembling those of *D. perfida* and *D. subperfida*.

*Male*: Body about 1.69 mm. Wing about 0.83 mm. by 0.3 mm. General coloration brown and pale yellowish resembling that of female.

Head with eyes almost contiguous, proboscis about one-third length of head capsule (7:20), clypeus with three setae on either side. Maxillary palp short, with non-spoon-like sensillae on basal part of segment 3 and five segments in proportion of 3:6:10:6:6. Antenna with scape yellowish, other segments including plumose hairs brown, flagellar segments with striation on basal parts before verticils, last segment with faint reticular

sculpture, fully twice as long as penultimate and its terminal stylet rather stout, segments from 11 to 13 short, shorter than twice 10 and with double nodes; relative length of distal six segments about 7.5:8:14:15:13.8:30.

Thorax with four median bristles and three median small setae on scutellum in addition to two lateral bristles. Legs almost entirely very pale, with knee joints fuscous; fore tibiae and hind femora very faintly fuscous on middle parts; hind TR about 2.7, hind tibial comb with five apical bristles. Relative length of leg segments, except for basal two, about 78:76:45:15:14:11: ? in fore, 82:86:46:17:15:12:13 in middle, and 88:86:54:20:18:14:15 in hind leg.

Wing with anterior veins very pale brown, stigmal area also very pale, macrotrichia arranged in lines along veins on middle area of wing, bare areas along veins very broad.

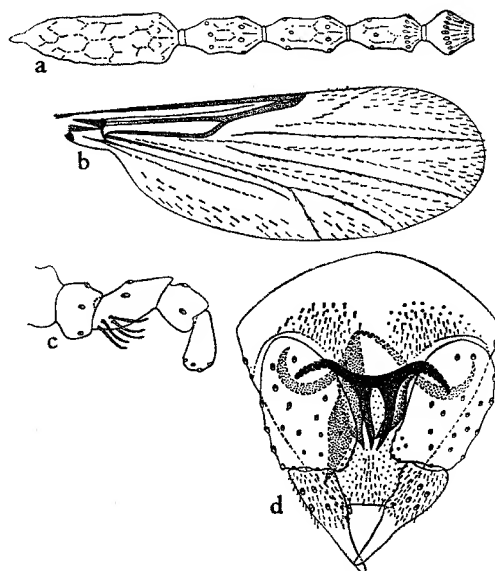


FIGURE 66.—*Dasyhelea striipennis*, male: a, distal five antennal segments; b, wing; c, maxillary palp; d, hypopygium.

Venation: Costa ending beyond middle of wing (36:64), R, M, and stem of fMCu in proportion of 18:15:29, Rs about 1.4 times as long as R<sub>1</sub> (12.5:9) and obliquely ending just before costal end, second radial cell about 0.3 as long as its stem vein (2.6:8.5) and far shorter than r-m (2.6:3.8), fMCu under tip of R<sub>1</sub> and its inner angle about 45 degrees, M<sub>2+3</sub> 1.7 times of Cu<sub>1</sub> (17:10). Haltere with stem brown, but knob yellowish differing from brown knob of female haltere.

Abdomen paler than in female; hypopygium brownish yellow, structure closely similar to that of *D. perfida* Johannsen, but somewhat different in the following points: Styles almost straight, anal points of tergite 9 almost absent, and two caudal lobes of aedeagus sharply pointed.

*Female*: Body length about 1.37 mm. Wing about 0.96 mm. by 0.31 mm. General structure and coloration similar to those of *D. subperfida* and *D. perfida*.

Head dark brown, with eyes very narrowly separated above, frons and mouthparts brown; frontal tubercle dark brown and cordiform; clypeus broad, with about six setae. Maxillary palp with segment 1 distinct, brownish, with two setae, five segments in

proportion of 4:6:11.5:7:8. Antenna entirely deep brown, with basal segments 3 to 5 subspherical, segments 6 to 9 more or less oval and somewhat angulate sub-basally in lateral aspect, segments 10 to 14 similar in shape to preceding ones, but somewhat longer, and barely twice as long as sub-basal width of angulate part, ultimate segment much longer, fully three times as long as wide, and with distinct terminal stylet; AR about 0.75 (62:83); proportion of distal eight segments about 10.5:10:11.5:11:11.5:12:12:20.5.

Thorax almost entirely brown, but scutum slightly paler on caudoscuteal area and lateral margins above wing bases; scutellum slightly pale brown and with two large lateral and four large median bristles and without small accessory setae. Legs with coxae, last tarsal segments, and basal ends of tibiae brown, other segments pale yellow but fore femur and tibia very slightly brownish; leg segments, except basal two, in proportion of 77:80:49:18:16:12:13 in fore leg, 87:99:55:20:17:13:14 in middle leg, and 94:95:71:25:22:15:14 in hind leg.

Wing with macrotrichia rather dense, costal and radial veins, apical part of costal cell, and second radial cell brown. Venation: Costa ending far beyond middle of wing (36:63.5), Rs long, about as long as R, and 1.5 as long as  $R_1$  (15:14.5:10), first radial cell absent, second cell small and about 0.45 as long as stem (18:40), stem of fMCu about one and two-thirds as long as R (25:14.5), fMCu just beyond tip of  $R_1$  and  $Cu_1$  ending just beyond costal end, inner angle of fMCu small. Haltere entirely brown.

Abdomen with tergites brown, pleural membranes brown, sternites of segments 4 to 5 reduced to paired hemisternites, that of segment 6 partially subdivided, other sternites highly reduced, obscure, and pale yellow; tergites with many distinct pale punctures at bases of setae; intersegmental bands yellow and narrow; spermatheca probably oval, with large, curved chitinated duct; cerci brown; subgenital plate without basal ring, somewhat Y-shape, its stem pale brown, caudal arms rather broad and arcuate, and caudal concavity between bases of arms U-shape.

Holotype, male (BISHOP 2757), Mt. Temwetemwensekir, Ponape I., light trap, Jan. 15, 1953, Gressitt. Allotype, female (US 64609), Koror I., Palau Is., at light, Nov. 30, 1947, Dybas. Paratype, female, same locality as allotype, July 24, 1957, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau, Ponape).

This species is somewhat allied to *D. subperfida* and *D. perfida*, except for the chaetotaxy of the scutellum and the small size. The two allied species are quite different from this species in the following points. In *D. subperfida*, distal antennal segments 10 to 13 are suddenly narrowed apically forming narrow neck parts, wing vein Rs is far longer than R, the second radial cell is long, about half as long as its stem vein, and the halteres have yellow knobs. In *D. perfida*, the antennal segments 7 to 13 are narrowed apically, forming narrow neck parts, AR is 0.94 and always larger than 0.9, the knobs of halteres are yellow along margins and brown on central parts and the hind femora are somewhat broadly brownish on the middle part.

#### 87. *Dasyhelea* sp. No. 8 (fig. 67).

Small, dark brown or black, with scutellum yellow. Antenna of female normally segmented, but provided with long plumose-like hairs somewhat resembling male antenna; AR about 1.01-1.09. Scutellum with four median bristles beside two lateral ones. Hind TR about 2.08-2.46. Wing with anal lobe almost absent. Abdominal sternites 3 and 4 irregularly partly atrophied and following sternites complete and square; spermatheca subspherical or oval; subgenital plate with basal ring cordiform, but thin, almost hyaline.

*Female*: Body length 1.07 (1.03-1.13) mm. Wing about 0.77 mm. by 0.27 mm.

Head dark brown, with mouthparts brown or pale brown, eyes just contiguous above, proboscis about half as long as height of head capsule (7.3:18); clypeus with about eight setae. Maxillary palp very pale, almost white, slender; segment 2 fusiform and with few sensillae on middle part of ventral side; four segments in proportion of 6.7:13.5:7.2:8.2. Antenna with scape dark brown, flagellum brown, flagellar hairs very long and dark brown; basal short flagellar segments oval and somewhat longer than wide, distal six segments with weakly developed sculpture on surface, segments 11 to 13 with several hairs at middle beside basal verticils, ultimate segment shorter than penultimate, tapered on apical quarter; AR 1.01-1.09; distal ten segments in proportion of 9.5:9.5:9:9.3:9.3:12.5:14.5:17.8:19.3:17.5.

Thorax almost entirely brown or dark brown, but scutellum yellow and with four median and two lateral bristles. Legs with coxae and last tarsal segments brown, femora brown, but both end parts paler, tibiae pale brownish yellow, but bases dark brown and

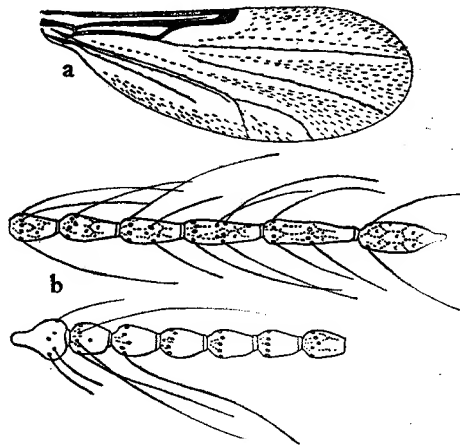


FIGURE 67.—*Dasyhelea* sp. No. 8, female: a, wing; b, flagellar antenna segments.

middle part of hind tibia somewhat more brownish, basal four tarsal segments very pale. Hind tibial comb with seven or eight apical bristles; hind TR 2.28 (2.08-2.46); leg segments, except for basal two, about 82.3:83.7:37.8:17.5:15.3:12.7:10.7 in fore, 93.7:93.3:56.7:20:16.3:12.8:11.7 in middle, and 90.7:89.7:55.5:24.2:19.7:14:12 in hind leg.

Wing with anterior veins and stigmal area very pale brown, macrotrichia rather dense, anal lobe almost absent. Venation: Costa ending at middle of wing (31:59), relative length of R, M, and stem of fMCu about 15.8:12.5:26.5, Rs about 0.6 of R (9.3:15.8), second radial cell small and slit-like, fMCu under tip of Rs and its inner angle about 45 degrees,  $M_{3+4}$  little shorter than twice of  $Cu_1$  (13.8:7.5). Haltere with stem brown and knob yellow.

Abdomen dark brown generally, with cerci brown; sternites 3 and 4 irregularly atrophied partly, following ones not reduced, being square, sternite 8 with four or five median bristles and two or four lateral ones; spermatheca round or oval (1+12.7 by 10 units) and with very short chitinized part of duct; subgenital plate with basal ring, cordiform, somewhat similar to that of *D. peliliouensis* Tokunaga, but very thin, being almost hyaline.

*Male:* Unknown.

DISTRIBUTION: Gilbert Is.

GILBERT IS. TARAWA: Betio I., six females, Teaoraereke I., female, Nov. 1957, Krauss.

This is allied to *D. peliliouensis*, but this female is highly specific in the possession of very long male-like verticils of antennae, in the possession of the longer penultimate than ultimate antennal segment and in the characteristic shape of the wing which is almost devoid of an anal lobe, highly differing from the allied species.

#### 88. *Dasyhelea* sp. No. 9.

Small, dark brown to brown; antennal segments 5 to 13 suboval, last antennal segment also oval and rather round at tip, terminal stylet completely absent; AR about 0.82; scutellum yellow, with four large median bristles and two or three small accessory setae; haltere with knob pale brownish yellow; legs with femora brownish and tibiae paler; abdominal sternites 3 to 6 more or less subdivided into paired hemisternites and following sternites subsquare; spermatheca subspherical; genital plate as in *D. nigripygma*.

*Female*: Body length about 1.28 mm. Wing about 0.78 mm. by 0.31 mm. General structure and coloration similar to *nigripygma*, but in this species scutellum yellow, knob of haltere yellowish, and abdominal sternites 3 to 6 subdivided into paired hemisternites.

Head dark brown, with frontal tubercle subrhombic, mouthparts brown; clypeus with 13 to 14 setae. Maxillary palp pale brownish hyaline, rather slender, and with five segments in proportion of 3.5:7.8:16.3:7.8:9.3. Antenna with scape deep brown, flagellar segments brown, segments 2 to 4 subspherical, segments 5 to 13 suboval and rather short, ultimate segment oblong, without terminal stylet, and somewhat round at tip; AR about 0.82 (54.5:66.5); proportion of distal eight segments about 9:9.3:9:10:10.8:11.3:10.3:13.8.

Thorax mainly brown, but scutum somewhat paler than allied species, obscurely pale brown on humeral areas and lateral parts above wing bases; scutellum yellow, with two large lateral and four large median bristles and few small accessory setae. Legs with coxae, femora, and last tarsal segments brownish, tibiae paler, basal four tarsal segments pale brownish hyaline; proportion of leg segments, except for basal two, 78:78.5:41.5:17.8:14.5:11:12 in fore leg, 94:92:45:18.5:16:11.3:12 in middle leg, and 91:84.5:55:23.3:19.3:12.5:12.5 in hind leg.

Wing with macrotrichia rather dense, cell  $M_4$  with about 34 trichia on membrane, costal and radial veins pale brown. Venation: Costa ending distinctly beyond middle of wing (34:60),  $R_s$  about 0.75 as long as  $R$  and about 1.76 as long as  $R_1$  (11:15:6.3), first radial cell absent, second cell about 0.7 as long as stem (17.5:24.5), stem of  $fMCu$  about 1.6 as long as  $R$  (24:15),  $fMCu$  under tip of  $R_1$ , and  $Cu_1$  ending just before costal end. Haltere with stem brown and knob pale brownish yellow.

Abdomen with tergites and pleural membranes brown, sternites 1 and 2 very much reduced, following four sternites more or less reduced to paired hemisternites, sternite 7 subsquare; tergites with obscure, pale-brown punctures at bases of setae; intersegmental bands absent or indistinct; spermatheca subspherical, brown, with very short chitinized duct and theca, about 11.5 by 9.5 units; subgenital plate with basal ring subcordiform and caudal arms tapered, arcuate and very widely divergent in U-shape.

*Male*: Unknown.

DISTRIBUTION: Mariana Is., Caroline Is.

MARIANA IS. SAIPAN: Near Lake Susupe, two females, Mar. 1945, Dybas.

PALAU. BABELTHUAP: Ngaremlengui, three females, June 1957, Sabsrosky. KOROR: Two females, Dec. 1947, Dybas.



This species is somewhat similar to *D. nigripygma*, but these two species are different as already noted. Also the scutum of this species is somewhat paler than in *nigripygma*.

#### 89. *Dasyhelea* sp. No. 10.

Pale brown, medium size; basal short flagellar segments oval and distal ones gradually elongate, segments 10 to 13 distinctly longer than preceding ones but oval, ultimate segment much longer than penultimate, about 2.6 as long as wide, and without terminal stylet; scutum brownish, broadly and obscurely paler on humeral areas, lateral parts above bases of wings, and lateral parts of caudoscuteal area; scutellum pale brownish yellow, with four large median bristles and small accessory setae; haltere with knob yellow; abdomen without pale punctures at bases of setae, sternites with segments 3 to 6 subdivided into paired hemisternites; subgenital plate with basal ring cordiform and caudal arms arcuate and divergent widely in V-shape as in *Dasyhelea* sp. No. 9; spermatheca oval or subpyriform.

*Female*: Body about 1.43 mm. long. Wing about 0.76 mm. by 0.29 mm. The pale color of this female seems to be due to its teneral state.

Head with vertex brown, frons and mouthparts yellowish brown, eyes just contiguous above broadly, frontal tubercle subrhombic; clypeus with about 14 setae. Maxillary palp pale yellow, slender, and with five segments in proportion of 4:9:15:9:9. Antenna with scape deep brown, flagellar segments brown; segment 3 round, following segments somewhat oval, slightly tapered, and bottle-like, segments 10 to 13 oblong, distinctly longer than preceding ones, about 1.7 as long as wide, apical segment far longer than penultimate, elongate, oval, about 2.6 as long as wide, tapered, somewhat round at tip, and without terminal stylet; AR about 0.86; proportion of distal eight segments about 9:9:9:11:11:11:11:17.

Thorax somewhat pale brown; scutum with humeral areas, lateral parts above bases of wings, and obscure, oblong spots on caudoscuteal area faintly paler; scutellum pale brownish yellow, with two large lateral and four large median bristles and small accessory setae. Legs with coxae, femora, tarsal segment 5, and knee joints brown, tibiae pale brown, four basal tarsal segments pale brownish hyaline; proportion of segments, except for basal two, about 82:80:44:17:15:12:11 in fore leg, 97:93:42.5:19:16:12:11 in middle leg, and 93:86:57:23:18:13.5:12 in hind leg.

Wing with macrotrichia rather dense, cell  $M_4$  with about 40 trichia on membrane, costal and radial veins brown. Venation: Costa ending just beyond middle of wing (30:58.5),  $R_s$  rather short, about 0.55 as long as  $R$ , and about 1.9 as long as  $R_1$  (8.5:15.5:4.5), first radial cell absent, second cell about 0.63 as long as stem (12:19), stem of  $fMCu$  about 1.4 as long as  $R$  (22:15.5),  $fMCu$  under tip of  $R_1$ , and  $Cu_1$  ending under costal end. Haltere with stem brown and knob yellow.

Abdomen with tergites pale brown, pleural membranes very pale brown, sternites of segments 3 to 6 subdivided into paired hemisternites, and those of other segments highly reduced and obscure; pale punctures at bases of tergal setae absent; intersegmental yellow bands very narrow; spermatheca somewhat pyriform and about 23.5 by 14 units; subgenital plate very closely similar to that of *D.* sp. No. 9.

*Male*: Unknown.

DISTRIBUTION: Caroline Is.

TRUK. Pis: Truk Atoll, female, June 1946, Townes.

This species is somewhat allied to *D.* sp. No. 9 and *D. sagittifera*. Compared with *D.* sp. No. 9, except for the difference of color, this female has a more slender antennae, a more elongate ultimate antennal segment, more reduced abdominal sternites, relatively shorter costal veins and  $R_s$ , and pyriform sper-

matheca. The female is also different from *sagittifera* in the following points: The frontal tubercle is subrhombic, AR is smaller than 0.9, the ultimate antennal segment has no papilliform tip, the scutellum is not highly setigerous, the costal vein of the wing is not much longer than twice of R, Rs is much shorter than R, and the spermatheca is not round but subpyriform.

**90. *Dasyhelea* sp. No. 11 (fig. 68, a-d).**

Medium size, brown; antennal segments 2 to 4 subspherical, segments 5 to 9 short oval, segments 10 to 13 also oval and about 1.5-1.6 as long as wide, ultimate segment about 2.4 as long as wide and blunt at tip, AR about 0.83; scutum brown, faintly yellowish on humeral areas, lateral parts above wing bases, and paired, oblong, lateral parts of caudoscuteal area; scutellum yellow, with four large median bristles and few small accessory setae; haltere with knob yellow; abdominal sternites well developed and subsquare; spermatheca short and oval.

*Female*: Body about 1.24-1.42 mm. long. Wing about 0.74-0.78 mm. by 0.3-0.32 mm. General structure closely similar to *D. striipennis*, except for the more brownish color.

Head with vertex brown, frons and mouthparts yellowish brown, labellum and palp brownish yellow and hyaline, frontal tubercle subrhombic; proboscis little longer than half height of head capsule (7:16.5); clypeus with about seven setae; maxillary palp slender, generally yellowish white, but last segment somewhat brownish, proportion of segments 6:14.3:6.3:7.8. Antenna with scape deep brown, flagellar segments brown, short, basal flagellar segments subspherical or short-oval, distal five oblong, ultimate segment with blunt or papilliform, oblong tip, and about 2.4 times as long as wide; AR about 0.8 (0.76-0.83); distal eight segments in proportion of 8:7.8:8.2:9.7:10.2:9.5:9.8:14.3.

Thorax mainly brown; scutum obscurely yellowish on humeral areas, lateral parts above bases of wings, and faint yellow on oblong lateral parts of caudoscuteal area; scutellum yellow, with two large lateral and four large median bristles and one to three small accessory setae. Legs with coxae, basal ends of tibiae, and last tarsal segments pale brown, femora very much paler, but with broad, obscure brownish clouds on middle parts of extensor sides, other segments very pale brownish yellow; leg segments, except basal two, in proportion of 75.3:75:42.7:17.7:15:11.7:11 in fore leg, 93.3:96.8:48.7:19.5:15.7:12.5:12 in middle leg, and 86.3:83.3:51:22.3:17.5:12.7:11.3 in hind leg, hind TR about 2.27 (2.25-2.29), hind tibial comb with five apical bristles.

Wing with macrotrichia rather dense, cell  $M_4$  with about 30 trichia on membrane, costal and radial veins and second radial cell brown. Venation: Anterior veins thick, costa extending little beyond middle of wing (31.8:58.5), Rs about 1.5 length of  $R_1$  (10.7:6.5), second radial cell very small and slit-like, little shorter than stem (18:21), relative length of R, M, and stem of fMCu about 14.5:12.3:24, fMCu under tip of  $R_1$ , its inner angle about 45 degrees;  $M_{3+4}$  about twice  $Cu_1$  (16:8.5), both veins slightly arcuate, and  $Cu_1$  ending under costal end. Haltere with stem brown and knob yellow.

Abdomen with tergites and pleural membranes pale brown, sternites well-developed, subsquare, and pale brown; pale punctures at bases of tergal setae absent; intersegmental tergal bands yellow and narrow; cerci pale brown; spermatheca brown, oval or subspherical, 1.8 + 13.2 by 11.8 units and with very short chitinized duct; subgenital plate similar to *D. peliliouensis*, but without petiole-like basal projection. Abdominal sternites 3 to 7 well developed and square.

*Male*: Unknown.

DISTRIBUTION: Mariana Is.

S. MARIANA IS. TINIAN: Southeast section, female, Mar. 1945, Dybas.

GUAM: Yigo, two females, Oct. 1957, Krauss.

This species is closely allied to *D. striipennis*, but distinctly different in the following points: The last antennal segment is only about 1.38 times as long as the penultimate, shorter than 1.55, AR about 0.83, less than 0.86, the stem of fMCu is about 1.63 times as long as R, longer than 1.4, the sternites are sub-square, not subdivided into paired hemisternites, and the spermatheca is smaller, oval, and about 14 by 11 units, not pyriform and much smaller than 14 by 23.5 units.

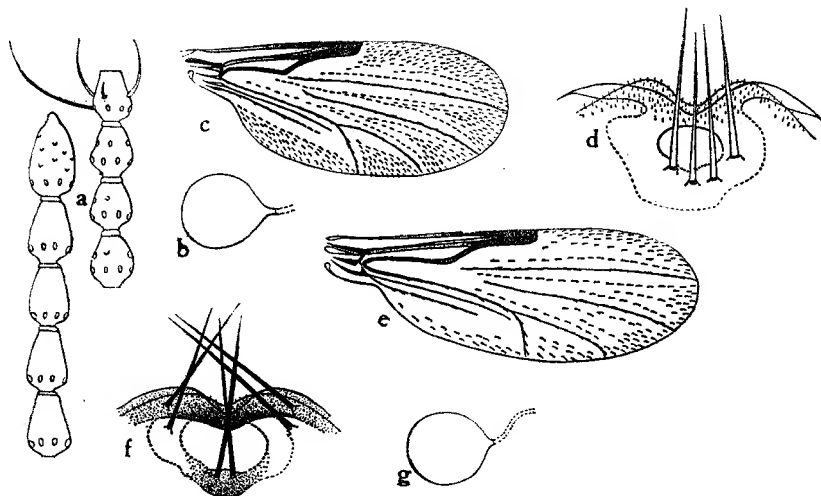


FIGURE 68.—a-d, *Dasyhelea* sp. No. 11, female; a, apical nine antennal segments; b, spermatheca; c, wing; d, subgenital plate. e-g, *D.* sp. No. 12, female: e, wing; f, subgenital plate; g, spermatheca.

91. *Dasyhelea* sp. No. 12 (fig. 68, e-g).

Small, brown; female with wing rather slender and macrotrichia sparse, being absent between vein M and stem of fMCu. Antenna of female resembling that of *D.* sp. No. 11; AR about 0.87. Scutellum yellow, with four median bristles and central minute seta beside two lateral bristles. Hind TR only 2.0. Abdominal sternites 3 to 7 not reduced but square; spermatheca and subgenital plate similar to those of *D.* sp. No. 11, but sternite 8 with six strong median bristles instead of four.

*Female*: Body length about 1.52 mm. Wing about 0.85 mm. by 0.29 mm.

Head brown, with eyes just touching above, proboscis about half as long as height of head capsule; clypeus with about nine setae. Maxillary palp pale brownish yellow, slender, with four segments in proportion of 7:17:7:9, segment 3 fusiform and with few spoon-like sensillae at middle of ventral side. Antenna with scape dark brown, flagellum brown, basal short flagellar segments spherical to short-oval, penultimate four segments oblong, as long as or little longer than twice width, ultimate 2.7 times as long as wide and with tip papilliform, striation and reticulation on surface of segments absent; AR about 0.87; distal ten segments about 9:9.5:9.5:9:9:11:12.5:12.5:13.5:16 in relative length.

Thorax mainly brown, but shoulder parts and lateral sides (above wing bases) of scutum yellow; scutellum yellow, with four median bristles and one central minute seta beside two lateral bristles. Legs mainly yellowish pale brown, but coxae, last tarsal

segments, bases of tibiae, and tip of hind tibia more or less dark brown, dorsal side of hind femur somewhat more brownish; hind TR about 2.0, hind tibial comb with six apical bristles. Leg segments, except for basal two, in proportion of 80:83:42:18:15:12:15 in fore, 102:105:52:20:17:13:15 in middle, and 94:90:50:25:19:13:15 in hind leg.

Wing with anal lobe almost absent, macrotrichia sparse, absent between M and stem of fMCu, stigmal area pale brown. Venation: Costa extending little beyond middle of wing (37:65), relative length of R, M, and stem of fMCu 18.5:15:27.5, Rs about twice of  $R_1$  (11:6), second radial cell rather long, almost as long as r-m (4.5:5) and slit-like,  $M_{3+4}$  twice of  $Cu_1$  (17:8.5), fMCu just beyond level of tip of  $R_1$  and its inner angle about 60 degrees. Haltere with stem brown and knob yellow.

Abdomen brown, pleural membranes with dark fine striation, sternites 3 to 7 not reduced but square, sternite 8 with six strong median bristles; cerci brown; spermatheca brown, subspherical (0.5+12 units by 11 units) and with minute chitinated part of duct; subgenital plate with basal ring cordiform, rather large, but not well chitinated.

*Male:* Unknown.

DISTRIBUTION: Caroline Is.

PALAU. BABELTHUAP: Ngaremlengui, female, light trap, June 1957, Sabrosky.

This is very closely allied to *D. sp. No. 11*. The present species, however, is highly specific in the following points. The distal five antennal segments are longer (but distinctly shorter than those of *D. peliliouensis*); the anal lobe of the wing is almost absent and macrotrichia are much more sparse, absent between vein M and stem of fMCu; abdominal sternite 8 has six bristles instead of four; and the central space of basal ring of subgenital plate is much larger, highly differing from the allied species.

## 92. *Dasyhelea multifascia* Tokunaga and Murachi, n. sp. (fig. 69).

Rather large, yellow and brown; mouthparts reduced; proboscis very short, conical, and only one-quarter as long as vertical length of eyes, maxillae and mandibles highly reduced; antenna with basal short flagellar segments mainly yellow, but each with brown ring along apical margin; AR about 1.0; dorsal side of thorax mainly brown with many yellow spots; legs yellowish pale brown, but coxae and trochanters mainly brown, fore femur with broad median band, hind femur with preapical pale-brown band, fore and hind tibiae with median pale-brown band, middle tibia with preapical pale-brown band, knee joints dark brown; abdomen with many yellow bands between brown tergites, lateral membranes with dark clouds; three spermathecae round, with slender duct.

*Female:* Body length about 2.34 mm. Wing about 1.24 mm. by 0.46 mm.

Head brown, with eyes contiguous above, clypeus with only about five median setae, proboscis very short, conical, and about one-quarter as long as length of eye, mandibles and maxillae highly reduced, serration absent. Maxillary palp mainly yellowish but last segment brown, with four segments in proportion of 13:17:14:18, segment 2 with several sensory hairs on basal half. Antenna with scape and distal six segments brown, preceding one brown on apical and yellow on basal half, short basal segments yellow, with brown ring along distal margin, and pair of slender long sensillae, without surface sculpture even on distal segments; proportion of distal eight segments about 13:14:15:18:21:21:21:31.5, AR about 1.01.

Thorax with brown scutum, with pair of yellow spots on humeral parts, pair of oval yellow spots on anterior part of caudoscuteal area, and two subconfluent yellow spots along lateral margins; scutellum mainly yellow and with small brown cloud at middle and both lateral parts brown; postscutellum uniformly brown; pleural sclerites yellowish pale brown; sternites brown. Legs with coxae brown, trochanters mainly brown except for apical yellow parts, knee joints dark brown, other parts of legs

extensively yellowish pale brown; in fore and hind legs, femora and tibiae with brown middle band, hind femur with rather small, pale-brown preapical band, hind tibia with broad, pale-brown middle band; in hind leg, tibia with rather small preapical band and femur without bands; scales of legs not developed. TR about 1.78 in fore leg, 1.84 in middle leg, and 1.51 in hind leg; leg segments, except for basal two, in proportion of 116:128:83:46.5:39.5:23: ? in fore legs, 156:181:97:52.5:35:24: ? in middle leg, and 156:170:97:64:40:30: ? in hind leg.

Wing rather densely clothed with long dark setae, especially on costal and radial veins, but bare areas along veins distinct, veins pale fuscous. Venation: Costa ending far beyond middle of wing (56:95), Rs as long as R (23:24), 1.5 times as long as  $R_1$  (23:15) and obliquely curved toward costal end at tip, first radial cell present, but slit-like,

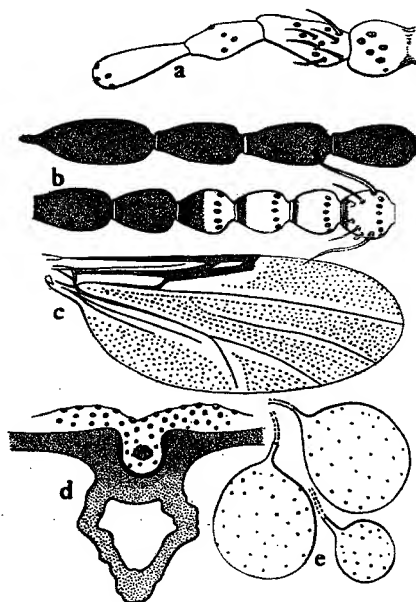


FIGURE 69.—*Dasyhelea multifascia*, female: a, maxillary palp; b, apical ten antennal segments; c, wing (macrotrichia represented by dots); d, subgenital plate; e, spermathecae.

second cell opened and shorter than first cell, much shorter than stem vein, stem of fMCu 1.5 times as long as R (36:24), fMCu under middle of  $R_1$ , costal end at level of basal one-fourth between tips of  $M_{2+3}$  and  $Cu_1$ ,  $Cu_1$  ending a little before tip of Rs. Haltere brown but knob yellow on ventral half.

Abdomen with tergites and sternites brown, membranous areas yellow; segment 1 without brown tergite; dorsal side with many yellow intersegmental bands; sternal side with small brown sternites, on segment 1, sternite subdivided into pair of small sclerites; lateral membranes with irregular dark clouds; cerci brown; three spermathecae brown, round, unequal, with slender chitinized duct and many minute hyaline punctures, 14 by 15.5±2 units, 13 by 15±2.5 units and 7.5 by 7±3 units. Subgenital plate with rather slender and cordiform basal ring, lateral arms rather slender and forming a rather deep and U-shape concavity between their bases. Sternite 8 strongly setigerous on middle part of caudal area.

*Male:* Unknown.

Holotype, female (US 64026), Sokehs I., Ponape, 2 m., Jan. 29, 1953, Gressitt.

DISTRIBUTION: Caroline Is. (Ponape).

This species is quite specific in the coloration of the legs and abdomen and in the structure of the mouthparts and spermathecae. The species name is related to the many yellow abdominal bands.

#### Genus *Culicoides* Latreille (1809)

*Oecacta* Poey (1851), *Psychophaena* Philippi (1865), *Haematomyidium* Goeldi (1905), *Cotocripus* Brèthes (1912), *Haemophoructus* Macfie (1925), *Synhelea* Kieffer (1925), *Prosapelma* Kieffer (1925), and *Hoffmania* Fox (1948).

Body moderately slender, not very hairy. Eyes usually bare, rarely with short or minute pubescence. Male antenna distinctly plumose, ultimate three segments distinctly longer than basal ones. Female antenna with segments 2 to 9 round or oval, 10 to 14 somewhat cylindrical and longer. Mesonotum usually dull, with short and few or no long bristles and often with pruinose pattern; humeral pits almost always large and distinct. Legs slender, femora without spines; hind tarsal segment 1 at least twice as long as 2; tarsal segment 4 shorter than 5. Claws small and equal in both sexes; empodium very minute. Wing with dense microtrichia over entire surface; macrotrichia present, usually abundant, often confined to wing tip; wing often with spotted marking. (Description of wing marking refers to Figure 76.) Costa extending more or less beyond middle of wing, two radial cells usually distinct and subequal in length, r-m oblique, median fork petiolate,  $M_1$  and  $M_2$  almost parallel, base of  $M_2$  more or less atrophied, mediocubital fork widely open,  $M_{3+4}$  somewhat arcuate at base, anal vein straight. Alula fringed; squama bare. Male hypopygium with sternite 9 short, transverse, more or less emarginate on caudal margin; tergite 9 usually with pair of anal points on caudal margin; coxite usually with distinct dorsal and ventral basal roots; style usually slender and curved; aedeagus usually subtriangular, with lateral arms; parameres paired, usually separated, more or less curved, with distal parts bent ventrad above tip of aedeagus.

#### KEY TO MICRONESIAN SPECIES OF CULICOIDES

1. Wing uniformly colored, without light and dark patterns; dark species; scutum with many small bristles..... 2
- Wing with at least one dark spot and usually two or more light spots..... 3
- 2(1). Female wing densely hairy, two rows of macrotrichia basally extending between M and stem of fMCu; male hypopygium with parameres flat at tips and folded up at distal part.....93. *ardentissimus*
- Female wing sparsely hairy, row of sparse macrotrichia basally extending between M and stem of fMCu; male hypopygium with parameres pointed and bent twice at apical part.....94. *kusaiensis*
- 3(1). Second radial cell of wing wholly (including its marginal veins) enveloped within second dark costal marking..... 4
- Second radial cell of wing at least partly or apical part of vein Rs enveloped within second pale costal marking..... 8
- 4(3). Wing with only two pale markings (first and second pale costal spots) and all other markings absent.....99. *sabroskyi*
- Wing usually with many pale markings and at least with three pale costal spots ..... 5

- 5(4). A small, round or oval light spot present under junction of two radial cells on basal area of cell  $R_5$ ; third costal light spot small, round and situated at apical corners of cell  $R_5$ .....95. *guttifer*  
No additional light spot under junction of two radial cells on basal area of cell  $R_5$ ..... 6
- 6(5). Third costal light spot round, separated from wing margin; cell  $M_1$  with only one oval, light spot at middle part.....96. *yoshimurai*  
Third costal light spot not round or not separated from wing margin; middle part of cell  $M_1$  dark and isolated pale spot on distal part of cell ..... 7
- 7(6). Third costal light spot large, oval, much broader than third costal dark area, and not separated from wing margin of apical part of  $R_5$ ; third costal dark area extending to tip of  $M_{3+4}$  forming narrow dark band.....97. *yasumatsui*  
Third costal light spot small, much narrower than third costal dark area, situated on distal corner of cell  $R_5$  but slightly separated from wing tip and not round; third costal dark spot very broad and extending caudad into cell  $M_1$  and  $M_2$ .....98. *flavimaculinotalis*
- 8(3). Wing pattern obscure and third costal pale spot very obscure..... 9  
Wing pattern distinct and third costal pale spot always distinctly present 10
- 9(8). Wing with macrotrichia very sparsely distributed only on apical quarter of wing.....104. *obscurus*  
Wing with macrotrichia densely spread almost all over surface, except on costal and radial cells.....100. *claggi*
- 10(8). Third costal light spot constricted at middle, far before distal corner of cell  $R_5$ .....101. *peregrinus*  
Third costal light spot large and suboval, on corner area of cell  $R_5$ ..... 11
- 11(10). In wing cell  $M_1$  basal light spot larger than distal one; third costal dark spot extending caudad to tip of  $M_{3+4}$  forming zigzag narrow band.....102. *peliliouensis*  
In wing cell  $M_1$  basal light spot smaller than, or as large as, distal one; third costal dark spot extending caudad to tip of  $M_{3+4}$  forming straight or oblique band (never zigzag)..... 12
- 12(11). Scutum with large yellow marking; one spermatheca only, well developed.....103. *esakii*  
Scutum dark brown and brown, without yellow marking; two spermathecae, well developed.....105. *palauensis*

93. *Culicoides ardentissimus* Tokunaga (fig. 70).

*Culicoides ardentissimus* Tokunaga, 1940, Philippine Jour. Sci. 71 (2) : 216 (Kusaie); 1940, Tenthredo 3 (2) : 179 (Caroline Is).

Small, dark-brown; wing without colored marking, entirely pale brownish white; macrotrichia over surface of wing in female, but scant on distal one-third of wing in male; legs uniformly brownish, without pale rings or bands; haltere brown.

*Male*: Body length about 1.31 mm. Wing about 0.77 mm. by 0.33 mm.

Head brown; clypeus with three pairs of lateral setae. Eyes narrowly separated above as wide as half a facet. Maxillary palp with segments in proportion of 5:7:10.3:5.5:7.5; segment 3 with sensory pore beyond middle. Antenna with scape brown; other segments pale brown, plumose hairs on segments 3 to 6, segment 2 with rather long petiole as long as apical node, all short basal flagellar segments fused and constricted into seven or ten nodes, apical three segments normal and cylindrical, in proportion of 35:19.5:64; distal three flagellar segments in proportion of 28:26:30.

Thorax uniformly brown; scutellum with three long bristles and several small accessory setae. Legs uniformly slightly pale brown; leg segments from femora to last tarsal segments in proportion of 85:82.5:38.5:17:12:9.5:12 in fore leg, 100.5:96:50.8:18:13:10.5:11.5 in middle leg, and 94:84:44:20.8:13:11.5:12.5 in hind leg.

Wing without colored marking; very sparsely hairy only on distal one-third of wing; cell  $M_4$  and anal cell without macrotrichia. Venation: First radial cell slit-like and almost as long as second, second radial cell somewhat rhombic and pointed at tip,  $R_s$  ending slightly before tip of  $M_{2+3}$ ,  $M_1$  almost straight together with  $M_{1+2}$ ,  $M_2$  widely atrophied on basal part, fMCu under middle of first radial cell, and about 60-degree angle between  $M_{2+3}$  and Cu $_1$ . Haltere brown.

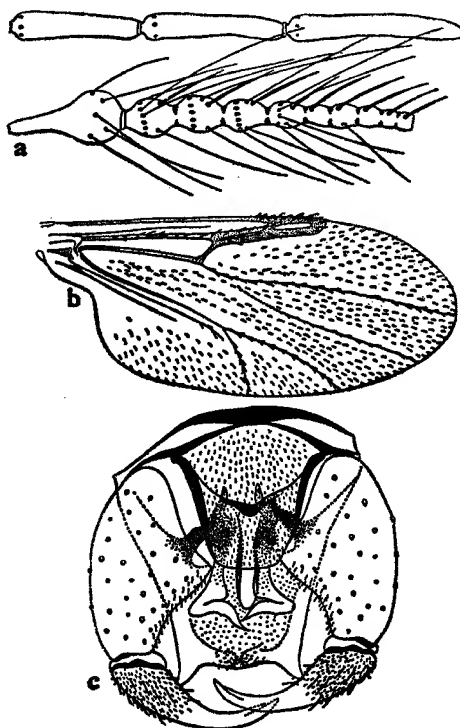


FIGURE 70.—*Culicoides ardentissimus*: a, flagellar antennal segments, male; b, wing, female; c, hypopygium, male.

Abdomen brown; hypopygium dark brown; tergite 9 trapezoid, fully as long as basal width, with anal points triangular, not sharply pointed, not emarginate on caudal margin, very short, broadly constricted on middle part; coxite distinctly arcuate and tapering, apical part as thick as one-third of basal width, with minute spinules on mesal side; style slender, slightly arcuate, slightly tapering, obliquely truncate on apical part, and with sharply pointed tip. Aedeagus with basal arch about one-third of total length, ventral swelling tapering, membranous, continuous on caudal membrane of sternite 9, finely spinulose as in *kusaiensis*, median lobe elongate, slightly clavate and twice as long as basal arch; parameres closely similar to those of allied species and each with minute sharp process on caudal margin of pointed apical part.



*Female*: Body length 1.5-1.7 mm. Wing about 1.4 mm. by 0.45 mm. Generally as in male in coloration and structure with usual sexual differences.

Head with eyes very narrowly separated above; clypeus with three pairs of setae; proboscis slightly shorter than vertical length of head; maxillary palp with segments in proportion of 7:18.5:23.5:8:10. Antenna uniformly brown, with AR about 1.4 (1.35-1.44); distal eight segments in proportion of 11:11:10.8:20.5:21.5:26:26.5:32.5.

Thorax reddish brown, slightly shining; scutum with pair of white or pale yellow spots on humeral pits, other pale marking very obscure; scutellum with two pairs of strong bristles and about 12 small accessory setae. Leg segments in proportion of 90.5:89.5:44:18.3:12:9.5:11.6 in fore leg, 111:110:57.5:18.5:13.8:10.7:13.7 in middle leg, and 103:102:49:22.7:14.2:12.7:13 in hind leg.

Wing rather densely clothed with macrotrichia almost all over surface, except for costal and basal radial cell, bare areas along veins rather narrow, in basal area of cell  $M_2$  between M and stem of fMCu, two lines of macrotrichia along both sides of furrow extending toward base far beyond midway of M and line of macrotrichia along beneath vein  $M_1$  extending toward base far beyond base of cell  $M_1$ . Venation: First radial cell elongate, oval, and about two-thirds length of second, second radial cell oval,  $R_1$  ending slightly beyond tip of  $Cu_1$ ,  $Rs$  ending just before tip of  $M_{2+4}$ , fMCu just beyond origin of r-m. Haltere brown. Scutellum usually with four bristles and rarely three.

Abdomen with tergites brown, sternites represented by paired small sclerotized patches, membrane yellow; two spermathecae, round, pale brown, equal, with short sclerotized duct, one spermatheca minute, tubular, frizzled, and pale brown.

#### DISTRIBUTION: Caroline Is.

Allotype, male (US), Pukusrik, Kusaie I., Feb. 1953, Clarke.

PALAU. BABELTHUAP: Ulimang, two males, Dec. 1947, Dybas; Ngiwal, 1 m., female, light trap, Dec. 1952, Gressitt; Ngiwal, four females, five males, May 1957, Sabrosky; Ngaremlengui, two females, six males, light trap, June 1957, Sabrosky; Imeliik, Netkeng, June 1957, Sabrosky; Melekeiok, May 1957, Sabrosky. KOROR: Female, May 1938, Murakami; two females, light trap, May 1957, Sabrosky; southwest part, two females, light trap, Dec. 1952, Gressitt. PELELIU: May 1957, Sabrosky.

YAP. YAP: Rumung I., female, June 1957, Sabrosky; Dugor, two males, Aug. 1950, Goss; Dugor Distr., female, June 1957, Sabrosky; North Yap I., three females, July 1950, Goss; Weloy, female, light trap, June 1957, Sabrosky.

KUSAIE. Pukusrik, two females, light trap, April 1953, Clarke.

The females of this species were first collected by Dr. T. Esaki from Kusaie in 1937. This species is thought to be distributed throughout the Caroline Islands. *C. kusaiensis* Tokunaga and this species are closely allied, both species having unmarked wings, but their male hypopygia and the distribution of macrotrichia of wings are distinctly different.

#### 94. *Culicoides kusaiensis* Tokunaga (fig. 71).

*Culicoides kusaiensis* Tokunaga, 1940, Philippine Jour. Sci. 71 (2): 215 (Kusaie); 1940, Tenthredo 3 (2): 181 (Ponape).

Small, brown, quite characteristic in possession of unadorned wings with very sparse suberect macrotrichia and in reduction of male antenna which is incompletely segmented into less than 14 segments.

*Female*: Body length about 1.45 mm. Wing about 0.78 mm. by 0.34 mm.

Head brown, with eyes very narrowly separated above; mouthparts brown, with proboscis about half as long as length of head. Maxillary palp with segments in proportion of 4:10:15:6:9; segment 3 with sensory pore of *obsoletus* subtype. Antenna brown; AR about 1.4; distal eight segments in proportion of 10.5:10.5:10.5:20:21.5:23.3:25.8:30.3.

Thorax almost uniformly brown; scutum with pair of white humeral pits, pair of pale-brown stripes on caudoscuteal area, and pair of pale, obscure narrow stripes along foveae; scutellum pale brown with three strong bristles and nine to 13 small accessory setae; pleural sclerites pale brown. Legs almost uniformly brown; proportion of segments from femur to last tarsal segment of hind leg about 80:80:36:18:15.2:8:8.

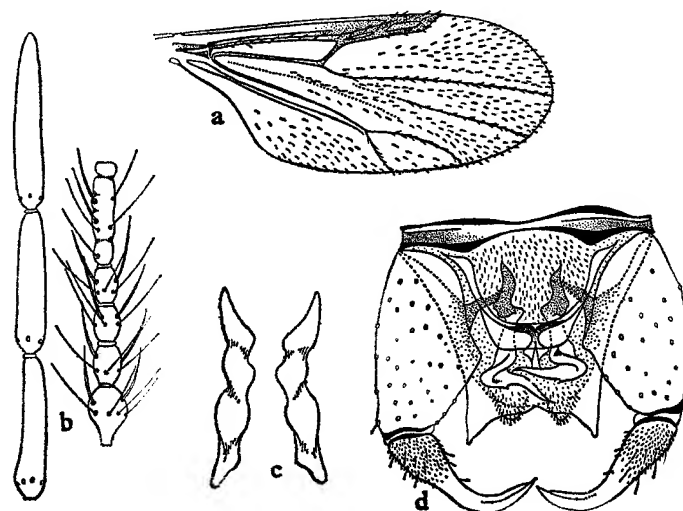


FIGURE 71.—*Culicoides kusaiensis*: a, wing, female; b, flagellar antennal segments, male; c, pair of massive parameres; d, hypopygium, male.

Wing rather broad, oval, uniformly fuscous, without pattern, macrotrichia rather sparsely spread almost all over surface, except basal one-third and area along Rs in cell  $R_5$ , bare areas along veins wide; in basal part of cell  $M_2$  (between veins M and stem of fMCu) two lines of macrotrichia along furrow not extending toward base beyond middle of M and line of macrotrichia along beneath  $M_1$  not extending toward base beyond basal corner of cell  $M_1$ . Venation: First radial cell hardly as long as second,  $M_{1+2}$  very short, base of  $M_2$  atrophied, fMCu far beyond forking point between  $M_1$  and  $M_2$ ,  $R_1$  ending slightly beyond level of tip of  $Cu_1$ , Rs ending far before tip of  $M_{2+4}$ . Scutellum usually with three bristles and rarely four. Haltere brown.

Abdomen brown, with sternites pale brown and represented by paired hemisternites, tergites brown and subsquare; spermathecae not clearly observed.

*Male*: Body length about 1.2 mm. Wing about 0.71 mm. by 0.3 mm. General structure and coloration as in female except for sexual differences.

Antenna without plumose hairs, at most 13-segmented, only nine-segmented in extreme cases, basal segments greatly reduced, basal five segmented distinctly, remaining short basal segments fused into long nodulous segment subconstricted into five or rarely six; three long distal segments in proportion of 37.3:31.7:35.7, combined length of last three segments about 1.3 to 1.6 times combined length of basal segments, except segment

1. Leg segments in proportion of 60:60:30:14:8:7.2:8 in fore leg, 76:76:36:13.6:10:6.8:8 in middle leg, and 72:72:30:18:10:8:10 in hind leg.

Wing with macrotrichia very sparsely scattered over surface, only about three in cell  $M_4$  and several in anal cell, line of few trichia extending proximad between  $M_{1+2}$  and apical one-third of stem of fMCu beyond level of fMCu, but not beyond level of end of r-m. Venation generally as in female, first radial cell linear, as long as second, and relatively longer than in female. Scutellum as in female.

Abdomen with sternites narrowed at middle and not subdivided into paired sclerites. Hypopygium brown; tergite 9 elongate trapezoid, longer than basal width, with anal points truncate, caudal margin shallowly emarginate; sternite 9 transverse, very deeply constricted by caudal broad concavity, with caudal membrane entirely spinulose. Aedeagus with basal arch very large, about two-thirds total length (18:8), semicircular, widely divergent proximad, apical one-third of each basal arm curved mesad, with shoulder angle, caudal projection somewhat narrowed basally and its apical half bifurcate into sharply-pointed needles, median lobe bifurcate, small, subtriangular, sharply pointed. Parameres rather broad, basal two-thirds strongly convex mesad, just touching at basal one-third, shallowly concave on lateral side, basal half widely divergent, and ending in blunt tip, apical half also widely divergent, distal one-third of each paramere tapering, abruptly curved mesad, then sharply curved latero-proximad, and ending in sharp point. Coxite somewhat triangular in ventral aspect, rather short and conical, without spinules on mesal side; style slender, longer than coxite, curved twice, first at middle and strongly at apical one-third, basal half pubescent and setigerous, apical one-fourth pointed.

DISTRIBUTION: Caroline Is., Marshall Is.

PALAU. BABELTHUAP: Ulimang, female, two males, Dec. 1947, Dybas; Ngiwal, two females, 34 males, light trap, May 1957, Sabrosky; Ngaremlengui, female, seven males, light trap, June 1957, Sabrosky. KOROR: Twenty-three females, 11 males, light trap, Apr., May 1957, Sabrosky. PELELIU: Mt. Amiangal, female, light trap, Dec. 1952, Gressitt. ANGAUR: three females, Feb. 1948, Dybas.

YAP. YAP: North Yap I., female, July 1950, Goss; Dugor, three females, July 1950, Goss; Kolonia, three females, May 1957, Sabrosky; Weloy, two females, male, June 1957, Sabrosky; Kanif, female, two males, July 1950, Goss; Ruul, female, Aug. 1950, Goss. GAGIL-TOMIL: Gagil Distr., female, July 1950, Goss; female, June 1957, Sabrosky.

KUSAIE. Pukusrik, female, at light, Apr. 1953, Clarke.

MARSHALL IS. ARNO: Female, June 1950, La Rivers.

This species is closely allied to *C. ardentissimus*, but in *ardentissimus* the body is darker and larger, the wings are more hairy, the maxillary palpi are longer and slender, the proboscis is much longer, and the male antennae and hypopygium are different.

#### 95. *Culicoides guttifer* (de Meijere). (Figure 72.)

*Culicoides guttifer* de Meijere (*Ceratopogon guttifer* de Meijere), 1907, Tijdschr. Ent. 50: 209.—Edwards, 1922, Bull. Ent. Res. 13: 161-168.—Johannsen, 1931, Archiv Hydrobiol., Suppl. 9, Tropische Binnengewässer, 403-447.—Macfie, 1934, Tijdschr. Ent. 77: 215.—Johannsen, 1946, B. P. Bishop Mus., Bull. 189: 190 (Guam).

Small, dark-brown or black; scutum brownish gray pruinose, with dark-brown or black marking; haltere brown; legs brown with paler or yellowish rings before and beyond knee joints of fore and middle legs; wing hairy over surface, with many light round spots as in the common Japanese *C. arakawae* Arakawa, but with distinct light round spot between  $R_s$  and forking point of  $M_1$  and  $M_2$  on basal area of cell  $R_s$ .

*Female*: Body length about 1.2-1.68 mm. Wing about 0.86-0.91 mm. by 0.38-0.41 mm.

Head entirely brown, with eyes separated above as wide as one-half or one facet. Clypeus with two pairs of setae. Maxillary palp brown, with five segments in proportion of 4.5:12.5:16:7.5:7.3; segment 3 somewhat fusiform and longer, with large sensory pore on distal half. Antenna with AR about 1.47 (1.35-1.55); scape reddish brown, other segments brown, basal short segments moniliform (segment 2 subspherical and as long as wide) and gradually elongate (segment 3 one and one-half as long as wide); distal five segments elongate, at least three times as long as basal width and slightly tapered, distal end half as wide as basal width; last segment without terminal stylet; distal nine segments in proportion of 8.2:8.2:8.2:9:17:18:20:19.8:24.

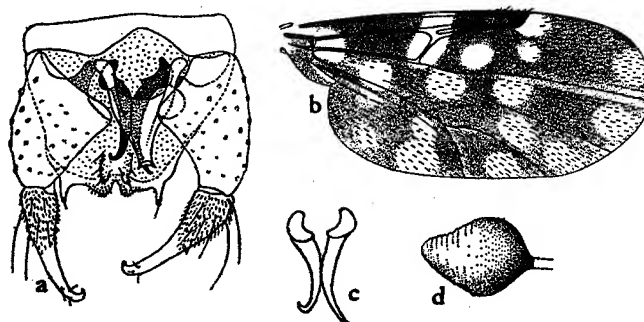


FIGURE 72.—*Culicoides guttifer*: a, hypopygium, male; b, wing (showing normal markings), female; c, pair of parameres; d, spermatheca of unusual specimen.

Thorax with tergal side black with brown pruinose pattern, and pleural and sternal sides uniformly brown and somewhat shining. In dry specimens, scutum mainly black and with following brown pruinose marking: Pair of small spots on humeral corners, pair of continuous longitudinal slender vittae along pseudoscutural foveae, also continuous with pair of ring-like spots surrounding round black spots on humeral pits, vittae surrounding pair of oval black spots on caudoscuteal area, and more or less constricted elongate spot on lateral sides above wing base. In alcoholic or mounted specimens, dark areas change to brown and pruinose brown areas to pale brown, round black spots on humeral pits disappear, humeral parts change to large pale-brown spots and oval black spots on caudoscuteal area disappear, this area becoming a large brown area with paired pale-brown vittae remaining. Scutellum brown, with pair of median and two lateral bristles and several minute accessory setae. Legs mainly brown; fore and middle legs with yellow rings before and beyond knee joints, hind leg with yellow rings only beyond knee joints; tarsi brown on basal segments and pale brown on distal ones; leg segments, except for basal two, in proportion of 83.5:81.5:44:16.8:12.5:9:11.5 in fore leg, 105:103:59:18.5:13:10.5:12.5 in middle leg, and 106.5:101.5:48.5:20.5:13.5:10.5:12.5 in hind leg.

Wing dark gray, with 16 isolated, round or oval, small light spots, which are arranged as in Japanese *C. arakawae*, but with distinct round spot between first and second pale costal spots under junction of two radial cells in cell  $R_s$ ; three pale spots around radial cells somewhat variable in size; macrotrichia rather thickly spread over surface, except for basal radial cell, but rather scarce on cell  $M_4$ , anal cell, and between M and stem of fMCu. Venation: Second radial cell larger than first (30:25),  $R_s$  about basal

two-thirds of wing (41:64) and ending beyond level of midway of wing margin between tips of  $M_{3+4}$  and  $Cu_1$ , fMCu under middle of first radial cell, base of  $M_2$  atrophied. Haltere brown.

Abdomen black and dusted in dry specimens.

*Male*: Body much smaller than female, being at most about 1.0 mm. Wing about 0.79-0.86 mm. by 0.30 mm. Coloration and specific characters mainly as in female except for usual sexual differences.

Head with eyes separated above as wide as two and one-half facets, clypeus with two pairs of setae. Maxillary palp with five segments in proportion of 5:9:12:7.5:9.5; segment 3 somewhat fusiform, with sensory pore beyond middle. Antenna with distal seven segments in proportion of 8.5:8.5:8:11:26:22:26; proportion of segments 2 to 10, 2 to 11, 11 to 14, and 12 to 14 about 92:103:86:75.

Thorax with pair of median and two long lateral bristles and pair of small accessory median setae on scutellum. Legs with coloration as in female; proportion of segments, except for basal two, about 85:79:42:17:12:10:11 in fore leg, 104:100:59:19:12:9:10 in middle leg, and 93:88:45:20:13:10:11 in hind leg.

Wing with macrotrichia rather thickly spread on apical half, without macrotrichia on basal area proximad the level of r-m, and macrotrichia sparse on cell  $M_4$  and anal cell; second paler spot situated just beyond tip of  $R_s$ , distinctly constricted into two round spots. Venation: First radial cell slit-like and subequal in length to  $R_s$  of second radial cell, distal part of  $R_1$  absent, thus costal and second radial cell continuous,  $R_s$  extending basal two-thirds of wing (40:65) and ending just beyond level of tip of  $Cu_1$ , fMCu under tip of first radial cell.

Abdomen with hypopygium brown; tergite 9 rather short, slightly shorter than basal width, somewhat trapezoid, caudal width about half of basal width, with pair of small conical anal points at caudal angles and a small V-shape incision at middle of caudal margin; sternite 9 transverse, with broad V-shape incision on caudal margin; coxite conical, slightly curved mesad, about one and one-half as long as basal width. Style slender, very slightly arcuate, basal one-third somewhat thickened, pubescent, and with several setae, each apical tip pointed and curved; parameres small, simple, contiguous at middle, then divergent and tapered, ending in ventrally curved tips, basal roots thickened, L-shape, short, and laterally extended, then curved cephalad. Aedeagus subtriangular, slightly longer than basal width between tips of basal arms, very slightly convex at lateral margin, broadly concave at basal margin, caudal tip strongly curved ventrad, basal arms short and narrow, and extending to basal angles of coxites.

DISTRIBUTION: Java, Sumatra, Malaya, Mariana Is., Caroline Is.

PALAU. BABELTHUAP: Ngerehelong, female, light trap, May 1957, Sabrosky; Ngiwal 1 m., female, light trap, Dec. 1952, Gressitt; Ngaremlengui, three females, male, June 1957, Sabrosky; North Ngatpang, 65 m., three females, light trap, Dec. 1952, Gressitt; Ngatkip, male, June 1957, Sabrosky; Imeliik, five males, June 1957, Sabrosky; Melekeiok, May 1957, Sabrosky; Ngerabad, May 1957, Sabrosky. KOROR: Three females, two males, Nov.-Dec. 1947, Dybas; four females, light trap, June 1957, Sabrosky; southwest part, 25 m., 13 females, three males, light trap, Dec. 1952, Gressitt; three females, Apr. 1953, Beardsley; female, May 1953, Beardsley. NGURUKDABEL (Urukthapel): Northeast part, 180 m., male, Dec. 1952, Gressitt.

TRUK. Ton: Mt. Unibot, 390 m., two females, light trap, Dec. 1952 to Jan. 1953, Gressitt.

The basal round pale spot of wing cell  $R_5$  is rather variable in size, but in many cases equal to the anterior part of second costal pale spot as shown in

figure 72, *b*. The spermatheca is usually elongated rather irregularly, but in some cases shorter as in figure 72, *d*.

According to Johannsen's description of var. *histrion* from Guam, the dark-brown or black markings of the scutum are as follows: A pair of narrow vittae anteriorly (or in some cases contiguous) between humeral pits, a pair of elongate oval spots in caudoscuteal area, a broad pair of elongate lateral vittae behind humeral pits, a transverse spot covering, and in front of, scutellar suture, and a more or less elongate oval area in front of each wing base. These scutal markings resemble those of the North American *C. crepuscularis* Malloch; the male hypopygium is similar to that of the North American *C. copiosus* Root and Hoffman, but the parameres are broad, less tapered, blade-like, pointed at tip, and never slender even at distal part.

**96. *Culicoides yoshimurai* Tokunaga (fig. 73, *a*, *b*).**

*Culicoides yoshimurai* Tokunaga, 1941, Annot. Zool. Japon. 20 (2): 114 (Truk).

Small, dark-brown; scutum in dry state black and shining, with gray pruinose marking; legs banded; wing dark, with distinct round pale spots, two radial cells covered with second costal dark spot,  $R_1$  atrophied on distal part and second radial cell continuous with costal cell; haltere brown.

*Female*: Body length about 1.38 mm. Wing about 0.85 mm. by 0.55 mm.

Head dark brown to brown, with mouthparts brown; clypeus with two pairs of lateral setae. Eyes barely separated above. Maxillary palp with segments in proportion of 5.6:10.8:13:5.8:5.3; segment 3 with small sensory pore just beyond middle. Antenna with scape brown, basal short flagellar segments pale brown to yellow and short oval, five long distal segments brown and cylindrical; no terminal stylet; AR about 1.37-1.43; distal eight flagellar segments in proportion of 8:7.9:8.3:15.5:17.8:17:17.6:24.4.

Thorax, in mounted specimens and alcohol, brown in ground color; scutum with yellow marking, instead of gray pruinose marking of dry specimens as follows: Pair of round spots at humeral areas, pair of large vittae on caudal two-thirds between longitudinal foveae, and small stripe on caudal half of lateral sides. Scutellum brown, with median bristle and pair of lateral long bristles and few small accessory setae on middle part; postscutellum dark brown. Legs brown; in fore leg, distal half of coxa, both ends of femur, base of tibia, and tarsal segments paler; in middle leg, coloration similar to that of fore leg, but coxa entirely brown; in hind leg, bases of femur and tibia and tarsal segments 2 to 5 pale brown; segments from femora to last tarsal segments in proportion of 70:65:37.5:12.5:7.5:6:8.5 in fore leg, and 85:80:35:12.5:10:7.5:10 in hind leg.

Wing short oval, adorned with light spots on dark ground color; macrotrichia spread on distal one-fourth, no trichia in cell  $M_4$ . Venation: Two radial cells and  $R_s$  entirely dark, first radial cell very narrow, second cell open,  $R_1$  atrophied, stem of fMCu strongly sinuous, fMCu before tip of first radial cell. Light spots of wing: Basal spot enveloping basal one-fourth of R and M and basal half of stem of fMCu, extending distad around arculus, confluent with light spot between  $M_{1+2}$  and fMCu, and partially extending caudad along basal margin of anal cell. First costal spot somewhat constricted by convex margin of first costal dark spot and first dark radial cell and enveloping r-m and distal one-third of R. Second costal spot widely separated from first light spot by broad second dark spot, and somewhat constricted by blunt projection of second dark spot below tip of dark  $R_s$ . Third costal spot round and situated at center of distal half of cell  $R_5$ ; cell  $M_1$  with only one small oval spot at middle part; cell  $M_2$  with small round spot at distal end; cell  $M_4$  with similar small round spot at distal corner; anal cell with gourd-shape spot before dark spot on  $Cu_1$ ; second costal dark spot rather broad, enveloping first and second

radial cells, but sometimes extreme tip of Rs pale; usually third costal dark band narrower than adjacent costal light spots, but sometimes third costal light spot reduced and third dark band as wide as second light spot and broader than third round light spot. Haltere brown.

Abdomen brown, with cerci pale brown. Two spermathecae oval, brown, equal, with very short chitinized duct; one spermatheca vestigial, brown, and somewhat cordiform.

*Male*: Body far smaller and coloration paler than in female, especially wing marking paler and basal half of wing uniformly paler.

Head pale brown including mouthparts, with eyes very narrowly separated above as wide as a facet; clypeus with two pairs of setae; mouthparts very short, with maxillary palp moniliform and five-segmented in proportion of 2:3:7:3.5:3.5. Antenna only nine-segmented; scape brown and other segments yellowish pale brown; proportion of antennal segments, except for first segment, about 14:8:7.5:7:15:17:16.5:24; proportion of segments 2 to 6, 2 to 5, 6 to 9, and 7 to 9 about 53:38:74:58; segment 5 and following three segments elongate, differing from preceding segments; ultimate segment cylindrical, ending in round tip.

Thorax far paler than in female, yellowish brown; scutellum with pair of long lateral bristles and single median bristle and pair of minute accessory median setae. Legs almost entirely yellowish pale brown; segments, except for basal two, in proportion of 65:60:27:10:7:6:8 in fore leg, 74:75:36:10.5:8:6:8 in middle leg, and 60:55:28:9:6.5:6:9 in hind leg.

Wing about 0.61 mm. by 0.29 mm., with venation obscure and radial cells very reduced, uniformly paler on proximal area from the level of r-m, but distal half with dark and pale marking as in female. Haltere yellowish white.

Abdomen pale brown. Hypopygium with tergite 9 trapezoid, as long as basal width and caudal margin narrower than half of basal width, with pair of distinct triangular anal points; sternite 9 transverse and very narrow, with caudal incision very shallow and broad, caudal membrane without spinules. Coxite large, slightly swollen basally, and arcuate; style slender, but shorter than coxite, basal one-third slightly swollen and pubescent, and apical two-thirds bare and strongly curved on apical one-fourth, but not sharply pointed at tip; aedeagus triangular, with basal arms divergent proximad and slender, apical part small, slender, and not pointed at tip. Parameres somewhat asymmetrical, quite separate, basal roots very large and brown, apical one-third strongly curved ventrad, hyaline, each with serrate edge, clavate or thorn-like projection beyond middle part. Other structure mainly as in female.

#### DISTRIBUTION: Caroline Is.

Allotype, male (BISHOP 2766), southeast Nanpohnmal, 50 m., Ponape, Jan. 1953, Gressitt.

TRUK. WENA: 121 m., female, June 1946, Townes. TON: Mt. Unibot, 200-390 m., native forest, 13 females, light trap, Dec. 1952 to Jan. 1953, Gressitt.

PONAPE. Southeast Nanpohnmal, five females, light trap, same data as for allotype; Colonia, female, Jan. 1953, Clarke; Agric. Exper. Sta., Colonia, female, July 1950, Adams; Agric. Exper. Sta., 16 m., six females, light trap, Jan. 1953, Gressitt; Mt. Temwetemwensekir, 180 m., 102 females, 16 males, light trap, Jan. 1953, Gressitt.

KUSAIE. Hill 1010, 300 m., 15 females, light trap, Mar. 1953, Clarke; Mutunlik, eight females, light trap, Jan.-Apr. 1953, Clarke; Mutunlik, nine females, light trap, Jan. 1953, Gressitt; Mwot, six females, light trap, Apr. 1953, Gressitt.

97. *Culicoides yasumatsui* Tokunaga (fig. 73, c, d).

*Culicoides yasumatsui* Tokunaga, 1941, Annot. Zool. Japon 20 (2): 113 (Truk).

Small, brown, with many yellow pruinose markings on scutum; legs brown with pale rings; wing adorned with pale spots, entire second radial cell enveloped in second dark costal spot; haltere in alcoholic specimens yellow or white and in dry state brown or dark.

*Male*: Body length about 1.2 mm. Wing about 0.85 mm. by 0.45 mm.

Head and appendages brown. Maxillary palp short, small, segments in proportion of 5:11:15:9:9; segment 3 with sensory pore just beyond middle. Antenna with distal seven segments in proportion of 10:11:10:12:31:29:35; terminal segment without stylet.

Thorax brown, pleural membranes extensively yellow; scutum with many yellow pruinose spots: Pair of large vittae between dark stripes along foveae on anterior half of scutum, two pairs of small round spots along anterior margin of humeral areas, pair of large oval or round and pair of small round spots obliquely arranged on anterior part of lateral areas at level of long median vittae, pair of large subtriangular spots on caudal half of lateral areas. Caudoscutal area between dark stripes uniformly pale brown or with X-shape brown spot on yellow ground color; in some dry specimens, yellow spots obscure, scutum almost uniformly brown with dark-brown margins and longitudinal foveae, but when specimens are mounted, yellow spots become distinct; scutellum yellowish brown or yellow, with brown median spot and two lateral and pair of large median bristles and several small median setae; postscutellum dark brown. Legs brown, but bases of all femora paler or white, with white or yellow rings before and beyond dark-brown knee joints, yellow ring at apical part of hind tibia, tarsal segments brown and paler on apical segments; proportion of leg segments about 18:16:9:3.5:2.5:1.5:2.5 in fore leg, and 19:19:9:4:2.5:2:2.5 in hind leg.

Wing paler than in female, adorned with paler large spots, with macrotrichia of membrane scanty, restricted to distal quarter of wing, numerous in cell  $R_s$ , but practically none between branches of fMCu. Venation: Costa extending beyond middle of wing (48:66), second radial cell as long as first and sometimes elongate oval, fMCu just beyond tip of first radial cell,  $M_{3+4}$  and  $Cu_1$  strongly curved. Light and dark spots: First costal light spot covering r-m and basal half of first radial cell; second costal dark spot covering distal half of first radial cell and entire length of second radial cell; second costal light spot just beyond tip of  $R_s$  and somewhat transverse, broader than second costal light spot and slightly convex toward base of wing; cell  $M_1$  with two light spots, one at base and one along distal margin; cell  $M_2$  extensively light, dark on distal one-third and with semicircular light spot along margin; cell  $M_4$  also with large semicircular light spot along margin; anal cell light, with dark cloud at middle covering middle part of stem of fMCu, and dark cloud covering  $Cu_1$  arm. Haltere pale brown to pale yellow.

Abdomen extensively white; tergites pale brown; sternites with paired pale-brown patches; pleural sides with pale-brown clouds. Hypopygium brown; tergite 9 somewhat square, slightly narrowed caudad and with pair of cylindrical anal points at caudal angles; coxite rather long, narrowed beyond middle and width of distal part about half of basal width; style attenuate distad, almost straight, but distinctly curved at slender tip; aedeagus broad and somewhat square or semicircular at basal part and projected caudad into stout lobe which is parallel at side and about twice as long as wide, paired chitinized, lateral plates each with small lateral cylindrical horn-like tubercle at middle. Parameres closely similar to those of *C. esakii* Tokunaga, but each stem part rather stout and with lateral semicircular lobe beyond middle, distal one-third strongly curved lateroventrad and palmate into about six fine filaments.

*Female*: Body length about 1.7 mm. Wing about 0.9 mm. by 0.55 mm. Generally similar to male with usual sexual differences.

Head brown uniformly, with mouthparts yellow, eyes broadly contiguous above; clypeus with four, and rarely six, lateral setae. Maxillary palp with segments in pro-



portion of 6.3:12.3:15.8:6.4:7; third palpal segment with scattered sensillae on distal part. Antenna with scape brown, other flagellar segments brown, without terminal stylet; AR about 1.53; distal eight segments in proportion of 8.6:8.6:9:18.4:20:21:21.8:29.5.

Thorax with scutellum setigerous with two pairs of strong bristles and about four minute accessory setae on lateral parts between two strong bristles. Legs mainly brown, but pale yellowish brown on basal ends of femora, on apical one-fourth of fore and middle femora, on basal one-fourth of all tibiae, and apical one-fourth of hind tibiae; knee joints dark brown, tarsi pale brown; leg segments from femora to tarsi in proportion of 97:87.5:49.7:18:12.5:9.5:13.7 in fore leg, 120:113.3:68.2:19:14.7:10.7:13 in middle leg, and 112:105.7:53.7:21.7:14.7:9.7:13.7 in hind leg.

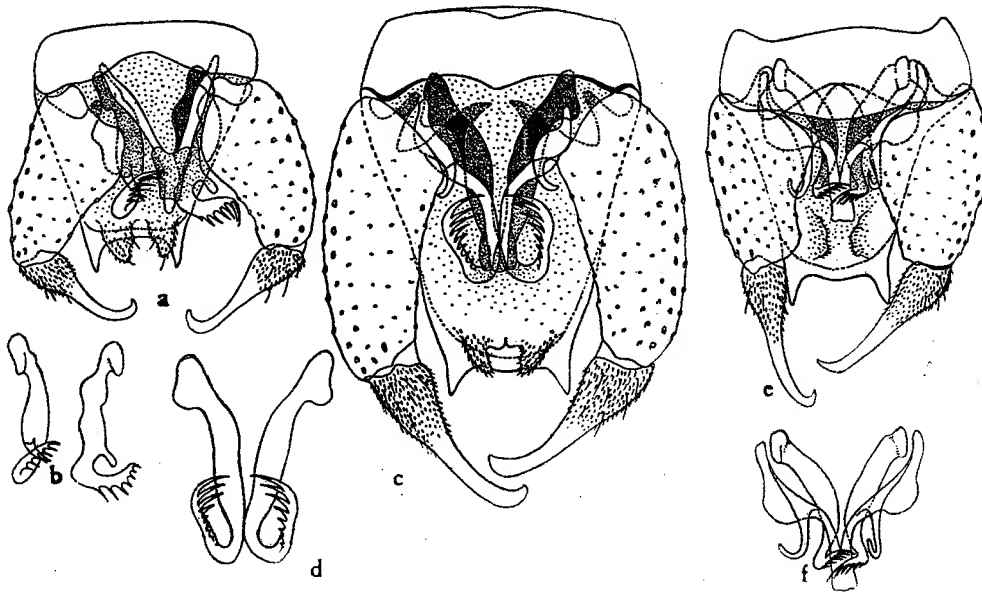


FIGURE 73.—a, b, *Culicoides yoshimurai*: a, hypopygium, male; b, pair of parameres. c, d, *C. yasumatsui*: c, hypopygium, male; d, pair of parameres. e, f, *C. flavimaculinalis*: e, hypopygium, male; f, pair of parameres.

Wing darker and with more distinct light spots than in male. Venation: First radial cell as long as second, second radial cell ending at round tip, fMCu under middle of first radial cell,  $R_1$  ending at level of tip  $Cu_1$  and  $R_s$  ending midway between tips of  $Cu_1$  and  $M_{3+4}$ ; macrotrichia of membrane sparsely and uniformly distributed on apical part beyond level of tip of  $R_s$  in cells  $R_s$ ,  $M_1$ , and  $M_2$ , on caudal half of cell  $M_4$  and on distal corner of anal cell. Wing light spots: Basal one large, covering arculus, basal one-third of  $R$ , basal half of  $M$ , and basal one-third of stem of fMCu, extending distad, confluent with light spot between  $M_{1+2}$  and fMCu, and extending caudad into basal area of anal cell. First costal light spot large, enveloping r-m, distal one-fourth of  $R$  and basal two-thirds of first radial cell. Second costal light spot somewhat obliquely elongate, not covering second radial cell, and slightly constricted before middle by dark second radial cell and convex dark third costal band. Third costal light spot oval, not occupying distal corner of cell  $R_s$  and rarely containing small dark cloud; cell  $M_1$  containing basal small elongate spot and distal narrow spot, cell  $M_2$  with small semicircular spot at tip; cell  $M_4$  with larger semicircular spot; anal cell with gourd-shape spot on distal part before dark spot

on Cu<sub>1</sub>; first and second costal dark spots narrowly confluent under end of r-m; third costal dark band extended broadly into cells M<sub>1</sub> and M<sub>2</sub>. Haltere brown in dry state and pale yellow in mounted specimens.

Abdomen brown, with tergites complete, sternites represented by paired brown patches; cerci yellow; two spermathecae brown, oval, equal, with short chitinized duct; one spermatheca minute, tubular, brown, and plug-shape.

#### DISTRIBUTION: Caroline Is.

PALAU. BABELTHUAP: Ulimang, 596 females, 53 males, at light, Dec. 1947, Dybas; Ngiwal, female, Dec. 1952, Gressitt; three females, at light, May 1957, Sabrosky; Ngaremlengui, two females, at light, June 1957, Sabrosky; Ngerabad, May 1957, Sabrosky; Melekeiok, May 1957, Sabrosky. KOROR: Five females, May 1957, Sabrosky; southwest part, 25 m., three females, Dec. 1952, Gressitt. NGERKABESANG: One, at seashore, Nov. 1947, Dybas. PELELIU: Four females, May 1957, Sabrosky; Mt. Amiangal, six, light trap, Dec. 1952, Gressitt.

TRUK. TON: Eighteen females, 11 males, at light, Apr. 1949, Potts.

KUSAIE. Pukusrik, female, light trap, Apr. 1953, Clarke; Mutunlik, female, light trap, Jan. 1953, Gressitt.

This species was first collected at Pata and Tonoas on Truk and is distributed widely in the Caroline Islands but is not abundant.

#### 98. *Culicoides flavimaculinotalis* Tokunaga (fig. 73, e, f).

*Culicoides flavimaculinotalis* Tokunaga, 1940, *Tenthredo* 3 (2): 180 (Ponape).

Minute, brown, with scutal yellow and yellowish pattern; wing sparsely hairy, with specific pattern of light spots, second radial cell in dark spot; legs brown and banded with yellowish rings; haltere white or yellow.

*Male*: Body length about 1.16 (1.14-1.2) mm. Wing about 0.62 mm. by 0.27 mm.

Head brown, with mouthparts very pale brown; eyes separated above as wide as a facet; clypeus with two pairs of long setae. Maxillary palp short, moniliform; segment 3 almost spherical, with large sensory pore beyond middle; five segments in proportion of 2.5:3:8:3:3.5. Antenna with scape brown, other segments and plumose hairs pale brown; segments 9 to 11 fused into nodulous long segment; last segment without terminal stylet; segments 2 to 8, segment 9, and distal three segments in proportion of 54:15:54.5; distal eight segments in proportion of 7:7:6:6:15:16.5:17:21.

Thorax brown and slightly shining, with distinct scutal pattern as follows: Pair of small yellow spots on humeral pits, pair of large, parallel, oval yellow spots on central part of anterior half of scutum, pair of yellowish-brown clouds around caudoscuteal area, pair of pale-brown clouds along lateral margins. Scutellum dark brown, with three long bristles and few small accessory setae; postscutellum dark brown; pleural sides extensively yellowish. Legs mainly brown, but bases of tibiae broadly yellow; trochanters, bases of femora, tips of tibiae, and last tarsal segments yellow or pale yellowish brown; segments of hind leg, except for basal two, in proportion of 60:54:24:12:7.2:4.8:7.2.

Wing with macrotrichia very sparse, distributed only on distal part of cells R<sub>5</sub> and M<sub>1</sub>. Venation: R<sub>5</sub> ending just beyond middle of wing (18:34), R<sub>1</sub> absent and two radial cells absent but R<sub>5</sub> complete, fMCu slightly before tip of M<sub>4+5</sub>. Wing with pattern of eight spots: Large basal spot extending distad between stem of fMCu and R and ending at middle of cell M<sub>2</sub>, another basal spot extending distad below basal part of stem of fMCu and along anal margin and confluent with gourd-shape spot before distal section of Cu<sub>1</sub>, first costal spot round, covering r-m and basal half of R<sub>5</sub>, second costal spot large, wedged

triangularly by third costal dark spot at distal margin and not covering dark tip of  $R_s$ , third costal spot small, oval, and at distal end of cell  $R_s$ , cell  $M_1$  with only one semicircular spot at tip, cell  $M_2$  with similar spot at tip, small oval spot just above fMCu, cell  $M_4$  broadly light, only basal angle being dark; first costal dark spot covering distal half of R and M; second costal dark spot covering distal half of  $R_s$  and  $M_{1+2}$ ; third costal dark spot somewhat rhombic and narrowly constricted at confluent part with broad dark area which covers basal two-thirds of cell  $M_1$ . Haltere white.

Abdomen with tergite 1 square and brown, other tergites and sternites represented by paired pale-brown patches, membranes white or pale yellow. Hypopygium with coxite brown and style yellow; tergite 9 trapezoid, somewhat longer than basal width, tapered distad, slightly convex at caudal margin between distinct, horn-like anal points; sternite 9 transverse, about one-third as long as wide and evenly convex at caudal margin; coxite rather slender, conical, and twice as long as basal width; style very slender, as long as coxite, tapered, pubescent only at base, each terminal end curved. Aedeagus with broad, somewhat square basal arch, basal arms expanded laterad forming semicircular lobe at each shoulder part, and bearing peculiar curved slender rod just beyond shoulder; caudal projection truncate at tip, slightly swollen before middle, and as long as basal height. Parameres long, stem parts rather broad, each with basal thickening at end and slightly sinuate, abruptly narrowed at middle, slender terminal half strongly curved ventrad in lateral aspect and coiled laterad in ventral aspect, and with extremely slender, sharply pointed apex which bears fringe of four or five fine spines at sides.

*Female:* Body length about 1.43 mm. Wing 0.97 mm. by 0.4 mm. General structure and coloration closely similar to those of male, with usual sexual differences.

Head with eyes broadly contiguous above, antenna and maxillary palp uniformly brown; clypeus with two pairs of lateral setae. Maxillary palp with segment 3 swollen, oval, with sensory pore beyond middle; five segments in proportion of 4:8:10:4:4.8. Antenna with basal short flagellar segments moniliform, distal five segments elongate, bottle-like, tapered, about three times as long as basal width of swollen part, and distal diameter about half of basal width; AR about 1.29; proportion of distal eight segments about 7.5:7.5:8:13.5:14:15:15:16.

Thorax with scutal marking more distinct than in male; scutellum with three long bristles and several small accessory setae. Legs more brownish than in male and distinctly banded; segments, except for coxae and trochanters, in proportion of 70:67:32:14:10:8:10 in fore leg, 86:83:45:14:10:8:10 in middle leg, and 87:73:36:?:?:?:? in hind leg (four distal tarsal segments broken).

Wing short, oval, darker, and with more distinct, smaller, light spots than in male; macrotrichia sparsely distributed on distal half of wing and cell  $M_4$  with several trichia, but anal cell without trichia. Venation:  $R_1$  present and ending at level of midway between tips of  $Cu_1$  and  $M_{3+4}$ ,  $R_s$  strongly curved upward before tip and ending just before tip of  $M_{3+4}$ , first radial cell slit-like and as long as second, second radial cell subtriangular, base of  $M_2$  narrowly atrophied, fMCu slightly beyond origin of r-m,  $M_{3+4}$  strongly arcuate,  $Cu_1$  ending at anal margin with angle about 90 degrees. Light spots: Basal one oblong, enveloping basal quarter of R and extending along anterior side of basal half of stem of fMCu, second costal spot small, round, enveloping r-m, and separate from costal margin, third costal spot subdivided into anterior small semicircular, and posterior large, gourd-like spot, third costal spot small, subcordiform, situated at distal corner area of cell  $R_s$ , but distinctly separate from wing margin and vein  $M_1$ , cell  $M_1$  with small oval spot and cell  $M_2$  with small round spot, these two spots situated at distal part of each cell, just separate from wing margin, cell  $M_4$  with semicircular spot at distal angle just touching vein  $M_{3+4}$  and anal wing margin, anal cell with long basal spot arising just beyond arculus and narrowly extending along wing margin under 1A, and ending at wing margin far before distal spot of this wing cell, distal spot of anal cell subconstricted into two small round spots and situated slightly before  $Cu_1$ , small obscure spot under distal half of  $M_{1+2}$ , distally extending to base of cell  $M_1$  above and to base of cell  $M_2$  beneath, small, obscure oval spot just above fMCu; second costal dark spot enveloping both radial cells and broadly confluent with dark wing spots. Haltere pale yellow or white.

Abdomen pale brown, with tergites brown, transverse, and band-like, sternites represented by paired brown patches; cerci yellow and very small; two spermathecae round, slightly unequal, brown, with rather long chitinated duct; one spermatheca minute, tubular, and brown; common duct of thecae brown and shortly chitinated, as long as wide.

**DISTRIBUTION:** Caroline Is.

Allotype, female (US), Hill behind Yaptown, 60 m., Yap Is., light trap, Nov. 1952, Gressitt.

PALAU. BABELTHUAP: East Ngatpang, 65 m., female, light trap, Dec. 1952, Gressitt; Ngiwal, May 1957, Sabrosky. KOROR: Female, light trap, May 1957, Sabrosky; southwest part, 25 m., three females, six males, light trap, Dec. 1952, Gressitt.

YAP. YAP: Male, same data as for allotype; Dugor, Weloy, June 1957, Sabrosky.

Dr. T. Esaki first collected the male of this species at Ponape in 1939, and now the female is reported. This species is not abundant everywhere but is rather widely distributed in the Caroline Islands.

**99. *Culicoides sabroskyi* Tokunaga, n. sp. (fig. 74).**

Rather large, brown, with wings very densely clothed with macrotrichia almost all over surface in female and sparsely on apical half in male and adorned with two pale costal spots on faintly fuscous ground color.

*Female:* Body about 1.72 mm. long. Wing about 1.08 mm by 0.43 mm. Wing marking closely allied to New Guinea *C. melanesiae* Macfie and Australian *C. subimmaculatus* Lee and Reye, only two costal pale spots being distinct.

Head entirely brown, with eyes narrowly separated above as wide as a facet, clypeus with four lateral setae on each margin, mouthparts brown, proboscis about one-third as long as length of head capsule. Maxillary palp stout, with large but shallow sensory pore on segment 3 just beyond middle, and five segments in proportion of 7:16:19:8:8. Antenna entirely brown, with basal short flagellar segments rather large and oval; AR about 0.87; relative length of distal eight segments about 12:11:12:15.5:14.5:16.5:17:21.

Thorax entirely brown; scutellum with four strong and a median small bristle and about 14 minute accessory setae. Legs with coxae brown, trochanters pale brownish yellow, other segments mainly brown, but all femoral bases pale brown, basal one-fifth of all tibiae yellowish, in hind tibia apical end narrowly yellow, first tarsal segments brown but other four distal segments paler; hind TR about 1.85; leg segments, except for basal two, in relative length of 118:110:58:24:16:13.5:17 in fore, 144:135:77:27:20:15:14.5 in middle, and 142:132:63:34:21:17:13 in hind leg.

Wing densely clothed with macrotrichia almost all over surface, except for costal, basal radial, first and second radial cells, bare lines along veins distinct; color marking very faint, wings slightly fuscous on costal half and very slightly on caudal half, base of wing paler, two pale spots rather distinct: one, first costal pale spot, suboval covering r-m and basal half of first radial cell, and another, second costal, round, small and not enveloping second radial cell, other spots all indistinct or absent, second costal dark spot covering apical half of first and whole second radial cell. Venation: Costa ending at basal 0.66 of wing length and slightly before tip of  $M_{3+4}$ ,  $R_s$  about 1.7 times as long as  $R_1$  (21:12) and curved up at end, second radial cell large, about twice as long as first (11.5:6.5) and ending just at second costal pale spot, relative length of R, M, and stem of fMCu about 22:20:34, fMCu under midway of first radial cell,  $M_{3+4}$  not deflected from its stem and about twice as long as  $Cu_1$  (21:11). Haltere entirely white.

Abdomen with tergites brown, sternites pale brown and subdivided into paired hemisternites, but penultimate two brown and not subdivided, pleural membranes fuscous, cerci brown. Two spermathecae, well developed, brown, subspherical, subequal (1+17 by 15 units and 2+16 by 14 units) and each with small neck part.

*Male*: Body about 1.66 mm. long. Wing about 1.04 mm. by 0.32 mm. Coloration as in female.

Head with eyes almost contiguous above and slightly pubescent on middle parts, proboscis about one-third as long as height of head capsule, clypeus with four or three lateral

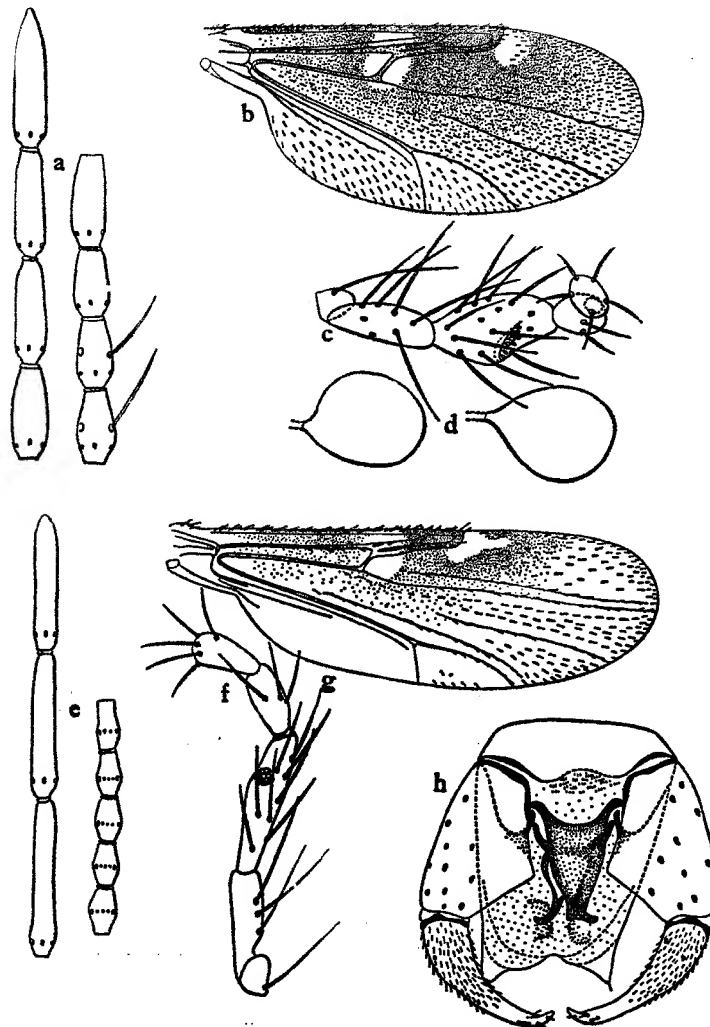


FIGURE 74.—*Culicoides sabroskyi*. a-d, female: a, distal eight antennal segments; b, wing; c, maxillary palp; d, spermathecae. e-h, male: e, distal eight antennal segments; f, maxillary palp; g, wing; h, hypopygium.

setae on either margin. Maxillary palp slender, with normal sensory pore on segment 3, five segments in proportion of 6:16:20:9:9. Antenna with scape and distal three long segments brown, short basal segments paler, plumose hairs brown; relative length of basal segments 2 to 11 and apical three segments together about 107:82 and those of apical eight segments about 7.5:6.5:7:7:8:30:26:25.

Thorax entirely brown; scutellum with similar bristles to those of female but with only six minute accessory setae. Legs with coloration as in female; hind TR about 1.76; leg segments, except for basal two, about 116:110:55:24:17:13:18 in fore, 140:133:76:28:19.5:14.5:17 in middle, and 129:127:58:33:22:16:17.5 in hind leg.

Wing with sparse macrotrichia on apical half, bare areas along veins distinct, cell  $M_4$  with very few macrotrichia, anal cell without trichia; fuscous and pale marking more indistinct than in female, second costal pale spot somewhat irregular in shape but never enveloping second radial cell. Venation: Costa ending just beyond middle of wing length (42:80) and above middle of cell  $M_4$ ,  $R_s$  about 1.5 times as long as  $R_1$  (14:9) and ending just at second costal pale spot, second radial cell subtriangular and little longer than first (7:5), relative length of  $R$ ,  $M$ , and stem of fMCu about 27:24:37.5, fMCu under septum between two radial cells,  $M_{3+4}$  not deflected from its stem, slightly arcuate, and about 2.3 times as long as  $Cu_1$  (17:7.5).

Abdomen with tergites brown, sternites far paler and almost hyaline, pleural sides fuscous. Hypopygium brown; tergite 9 rather long, tapered, with shallow median emargination on caudal margin and anal points triangular; sternite 9 with caudal emargination very slight and caudal membrane slightly spinulose on anterior part; coxites rather short, subtriangular in ventral aspect and slightly shorter than styles (32:34); styles arcuate, tapered and pubescent on basal half or more; aedeagus elongate, subtriangular, with basal arch very low, about one-fifth of total length (5:26), median lobe tapered gradually and truncate at tip; parameres fused forming oval central part, basal feet slender and articulated with slender roots of coxites, apical parts divergent from each other, about one-third as long as total length, little longer than basal roots (7.5:6), beyond tip of aedeagus, ending in slightly arcuate and blunt apices far before caudal margin of tergite 9.

Holotype, female (US 64610), Koror I., Palau Is., May 30, 1957, light trap, Sabrosky. Allotype, male (US), Melekeiok, Babelthup I., Palau Is., May 22, 1957, light trap, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau).

This species is closely similar to the New Guinea *C. melanesiae* Macfie and Australian *C. subimmaculatus* Lee and Reye in the wing marking. These two allied species, however, differ from the new Micronesian species in the following: In the New Guinea allied species, segment 3 of the maxillary palp is not provided with sensory pore; the first costal pale spot does not extend anteriorly as far as the costal margin; the knob of the haltere is pale brownish; all legs bear dark knee joints; and hind TR is larger, about 2.2. In the Australian allied species, the legs are devoid of paler bands, the short flagellar segments are entirely subspherical, AR is about 1.08, segment 3 of the maxillary palp bears scattered sensillae on the apical part, the penultimate tarsal segments are cordate and hind TR is about 1.9-2.0. Males of both allied species are unknown.

#### 100. *Culicoides claggi* Tokunaga, n. sp. (fig. 75).

Rather large, brown; wings adorned and densely hairy. Maxillary palp with large sensory pore on apical part of segment 3; antenna of female with basal short flagellar segments yellow, spherical to short-oval, AR about 2.0. Legs with sub-basal pale rings

on all tibiae, hind TR about 2.27. Thorax almost entirely dark brown in dry specimens, but scutum showing four yellowish pale-brown vittae on anterior half in mounted specimens; scutellum with four strong bristles and several minute setae. Wing thickly hairy, with basal, first and second costal pale spots distinct, other pale spots very much obscure, disappearing under transmitted light, second costal pale spot enveloping distal part of second radial cell. Abdominal sternites 3 to 6 separated into paired hemisternites; two spermathecae subequal and subpyriform and one tubular.

*Female*: Body length about 1.53 (1.39-1.82) mm. Wing about 1.28 (1.24-1.33) mm. by 0.51 (0.51-0.52) mm. In dry specimens dark brown, in mounted specimens brownish.

Head dark brown, with mouthparts brown, eyes narrowly separated above as wide as a half of a facet, clypeus with three setae on either lateral side and sometimes with one or two additional setae, proboscis slender, long and about 0.7 as long as height of head

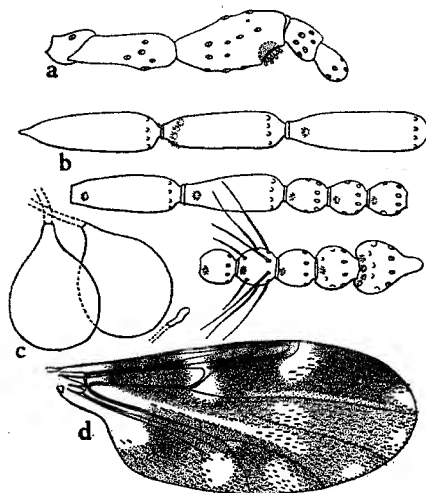


FIGURE 75.—*Culicoides claggi*, female: a, maxillary palp; b, flagellar antennal segments; c, spermathecae; d, wing.

capsule. Maxillary palp rather slender, segment 3 long-oval and with sensory pore rather large and situated on apical part, five segments in proportion of 7.5:21:22:9:8.8. Mandible with 14 subequal teeth but apical one a little larger. Antenna with scape dark brown, following short basal flagellar segments yellow, except for brown segment 9, five elongate segments brown; segments 3 to 5 or 6 spherical, those 6 or 7 to 9 short-oval, each short flagellar segment with two long and two small sensory hairs and sensory pore; segment 10 longer than twice of 9; AR about 2.03 (1.87-2.2).

Thorax (in mounted specimens) mainly brownish; scutum with anterior margin dark brown, four scutal vittae yellowish pale brown, short, ending little beyond level of scutal sutures, caudoscuteal area fuscous yellow, lateral sides yellowish brown including scutal sutures; scutellum yellowish brown and with four strong bristles and several small setae; postscutellum dark and with distinct hyaline spot; pleural and sternal sides brown. Legs with coxae, femora, and tibiae mainly fuscous brown, but femoral bases and trochanters paler, tibial bases brown, sub-basal parts white and distal part of hind tibia paler, all tarsi very pale brown; hind TR about 2.27 (2.21-2.4), hind tibial comb with four apical bristles, claws simple and each with basal hair-like structure; relative length of distal seven segments about 111.5:108.7:56:23:16:12.3:13.7 in fore, 138.7:136.7:74.3:24.3:17:13:14 in middle, and 136.3:130.7:63.7:28:18.5:14:15 in hind leg.

Wing clothed with rather dense hairs almost all over surface, except costal, basal and two radial cells, adorned with paler spots, of which basal and two costal are distinct, but other spots very much obscure and disappear under transmitted light, second costal pale spot enveloping distal one-third of second radial cell, apical three marginal spots very small. Venation: Costa ending distinctly beyond middle of wing (66.2:97), relative length of R, M, and stem of fMCu about 33:28.7:41.3, Rs about 1.5 times as long as  $R_1$  (25.2:16.3), first radial cell slit-like, second radial cell rather long, subtriangular and little longer than first (11.7:10), fMCu slightly beyond level of origin of r-m or under mid-way of first radial cell,  $M_{3+4}$  about twice as long as  $Cu_1$  (30:15.7) and ending more or less beyond level of costal end,  $Cu_1$  ending under tip of  $R_1$  or slightly beyond that. Haltere white.

Abdomen with tergites pale brown, sternites reduced into paired hemisternites on segments 3 to 6 and pale brown, pleural membranes with fuscous fine striation; two spermathecae dark brown, subequal, subpyriform (3+16.5 by 14.7 units and 4+15 by 13.7 units) and each with conical chitinized part of duct, one tubular, vestigial (4.7 by 1 unit) and brown; cerci brown.

Male: Unknown.

Holotype, female (BISHOP 2758), Futami-ko, Chichi Jima, Bonin Is., May 10, 1956, Clagg. Paratypes, seven females (BISHOP, US), with holotype.

DISTRIBUTION: Bonin Is. (Chichi Jima).

Closely allied to *C. okinawensis* Arnaud, but the allied species is different from the present new species in the following points: The basal flagellar segments of the female antenna are short-oval to oval, being distinctly longer than wide, AR is less than 2.0, about 1.28, the mandible is provided with 17 teeth, the tibiae are not provided with paler sub-basal rings, the hind TR is smaller, about 2.0, and the hind tibial comb bears five apical bristles. Another allied species may be *C. obscurus* Tokunaga and Murachi; however, in the allied species, the wings are very sparsely clothed with macrotrichia only on apical margins, AR is far smaller, only about 1.2 to 1.43, and the hind TR is also smaller, usually less than 2.2, differing from *claggi*.

101. *Culicoides peregrinus* Kieffer (fig. 76, a).

*Culicoides peregrinus* Kieffer, 1910, Indian Mus., Mem. 2: 191 (East India).—Edwards, 1922, Bull. Ent. Res. 13: 161-168.—Johannsen, 1931, Archiv Hydrobiol., Suppl. 9, Tropische Binnengewässer, 403-447.—Mayer, 1934, Archiv Hydrobiol., Suppl. 13, Tropische Binnengewässer, 166-202 (pupa).—Macfie, 1937, Roy. Ent. Soc. London, Proc. B, 6: 111-118.—Tokunaga, 1937, Tenthredo 1 (3): 305.—Buckley, 1938, Jour. Helminth. 16: 121.

*Culicoides judicandus* Bezzi, 1917, Philippine Jour. Sci. 12: 108.

*Culicoides esmoneti* Salm, 1917, Geneesk. Tijdschr. Ned.-Ind. 57: 749-753.

*Culicoides philippensis* Kieffer, 1921, Philippine Jour. Sci. 18: 557-593.

*Culicoides peregrinus* var. *assamensis* Smith and Swarminath, Tokunaga, 1940, Tenthredo 3 (2): 179.



Brown or dark-brown; scutum with distinct dark or black vittae; wing with many clear spots, second costal light spot enveloping distal half of second radial cell, third costal light spot much before distal end of cell  $R_5$  and sharply constricted at middle, cell  $M_4$  with two light spots, one at fork between  $M_{3+4}$  and  $Cu_1$ , and one round spot at distal part. Haltere brown. Legs brown, but with yellowish bands.

*Female*: Body length about 1.45 mm. Wing about 1.26 mm. by 0.57 mm.

Head brown, with eyes just contiguous above; clypeus with two pairs of long setae. Maxillary palp brown, segment 3 long and with sensory pore at distal one-third, five segments in proportion of 7:21.5:25.7:9.8:10.7. Antenna with scape reddish brown, other segments slightly pale brown, but yellowish on basal area of flagellar segment, basal short flagellar segments at least twice as long as wide, five long distal segments at least four times as long as wide; AR about 1.0; distal eight segments in proportion of 13.5:13.5:14.5:19.5:20.5:21.5:28.5:34.5.

Thorax brown and pruinose; scutum with dark or black pattern, anterior margin of shoulder parts dark, shoulder angles black, pair of dark oval spots at anterior one-fourth of scutum, pair of elongate dark vittae along lateral sides of foveae, small triangular cloud on caudoscuteal area along caudal margin. Scutellum brown, with pair of dark clouds, pair of long bristles at middle, and small setae on lateral end. Legs mainly brown, with knee joints dark brown, tarsal segments yellowish white, fore and middle legs with distinct pale-yellow rings above and beneath knee joints, hind leg without femoral pre-apical ring but with distinct pale-yellow ring on end of tibia; leg segments, except for basal two, in proportion of 106.5:105:61:24:17:12.1:14.9 in fore leg, 134.5:144.5:67.5:27.2:18:12:15 in middle leg, and 144.5:149:61.5:31:20.1:13.9:14.1 in hind leg.

Wing dark, with distinct light spots; distribution of macrotrichia and pattern of light spots rather variable; macrotrichia in many cases very sparse, being distributed only on costal area of cell  $R_4$ , along distal margins of cells  $M_1$  and  $M_2$ , arranged in line above and below distal two-thirds of  $M_1$  and distal one-fourth of  $M_2$ , and in a short line above distal tip of  $M_{3+4}$ . In rare cases, macrotrichia rather widely distributed on distal half of cells  $R_5$ ,  $M_1$ , and  $M_2$ , on entire surface of cell  $M_4$ , and on marginal area of anal cell. Venation:  $R_1$  ending at level of tip of  $Cu_1$ ,  $R_5$  ending at about distal one-third of wing and at middle between tips of  $M_{3+4}$  and  $Cu_1$ , first radial cell slit-like as long as second, and its basal one-third enveloped in first costal light spot, second cell somewhat triangular, its distal half and tip of  $R_5$  enveloped in second costal light spot, fMCu under middle of first radial cell. Pattern of light spots: In many cases, light spots large, basal large spot extending distad under  $M_1$ , subconfluent with first costal light spot and spot beneath forking point between  $M_1$  and  $M_2$  and obliquely extending into anal cell; first costal spot arising from costa, enveloping tip of  $R_1$ , basal one-third of first radial cell, r-m, tip of  $M$  and base of  $M_{1+2}$  and triangularly concave in V-shape on its basal margin; second light spot arising from costal margin, extending caudad, ending before  $M_1$ , enveloping costa of second cell and tip of  $R_5$ , its basal margin concave by triangular extension of second costal dark spot along  $R_5$ , and its distal margin slightly convex triangularly beneath costal margin; third costal light spot situated at distal one-third of cell  $R_4$ , separate from costal margin and  $M_1$ , and constricted at middle; cell  $M_1$  with oval small spot at middle and smaller oval spot at distal one-third; cell  $M_2$  with small oval spot under middle of  $M_2$  and smaller round spot on distal area slightly separated from distal margin; cell  $M_4$  with triangular spot within fMCu and round small spot along distal margin of cell; anal cell with large oblong spot which is part of basal spot in basal half, small subtriangular spot under tip of 1A and small round spot before  $Cu_1$ , oval small spot just above fMCu, very small semicircular spot at ends of  $M_1$ ,  $M_2$ , and  $M_{3+4}$ . In rare cases, wings darker, light spots smaller, basal spot not confluent with first costal spot, small oval spot under  $M_{1+2}$  separate, basal oblong spot of anal cell divided into basal large and distal small spots, stem of fMCu and  $Cu_1$  enveloped in long dark cloud, three semicircular spots at ends of  $M_1$ ,  $M_2$ , and  $M_{3+4}$  absent. Haltere brown.

Abdomen brown, with tergites and sternites not reduced; cerci brown; two spermathecae large, brown, slightly unequal, one round and one oval with very short chitinized duct; one spermatheca vestigial, minute, tubular and undulate.

*Male*: Body length about 1.25 mm. Wing about 1.08 mm. by 0.39 mm. Generally similar to female in coloration and structure with usual sexual differences.

Head broken.

Thorax closely as in female. Legs with proportion of segments from femora to last tarsal segments 108:105:59:25:17:13:16 in fore leg and 132:137:72:27:19:13:16 in middle leg; hind legs broken. Wing narrower and paler than in female, without macrotrichia on membrane. Venation:  $R_1$  ending at level of fMCu, first radial cell about two-thirds as long as second,  $R_s$  ending at distal one-third of wing, base of  $M_s$  atrophied, tip of  $Cu_1$  ending under middle of costa of second radial cell; small light spots present at tips of  $M_1$ ,  $M_s$  and  $M_{s+4}$ .

Hypopygium brown; tergite 9 fully as long as basal width, paraboloid, without anal points, and with shallow median incision at round caudal margin; sternite 9 with only slight caudal excavation and caudal membrane bare; coxite slender, fully twice as long as basal width, each inner side with prominent patch of spines from near base becoming slender and continuing as setae of same length to apex; style slender, as long as coxite, slightly arcuate, each apex only slightly expanded. Aedeagus with basal arch slender, high, basal roots slightly curved laterad, caudal projection long, basal half tapered and distal half slender, strongly curved ventrad, and ending in round tip; parameres rather stout, basal one-third rather broad, subtriangular, distal two-thirds divergent from each other and slightly curving ventrad, and apical fifth strongly curved ventrad and attenuated to fine hairy tip.

**DISTRIBUTION**: India, Seychelles Is., Assam, Philippine Is., Java, Malaya, Sumatra, Formosa, and Caroline Is.

**PALAU. BABELTHUAP**: Ngerehelong Pen., female, male, May 1957, Sabrosky; Ngiwal, 1 m., female, light trap, Dec. 1952, Gressitt; Ngaremlengui, four females, male, light trap, June 1957, Sabrosky; Imeliik, Netkeng, June 1957, Sabrosky; Melekeiok, May 1957, Sabrosky. **KOROR**: Female, at light, Apr. 1953, Beardsley; July 1956, McDaniel.

**YAP. YAP**: Female, Oct. 1952, Krauss; hill behind Yaptown, 50 m., male, light trap, Dec. 1952, Gressitt; South Yap I., female, July-Aug. 1950, Goss; Giliman, two females, June 1957, Sabrosky.

The wing pattern and distribution of wing macrotrichia in this species are rather variable. The Micronesian and Malayan specimens have paler wings and belong to the type of *C. assamensis*, differing from typical *C. peregrinus* and Formosan specimens. According to Johannsen, *C. esmoneti* Salm is identical with *peregrinus* Kieffer; according to Edwards, *C. judicandus* Bezzi and *C. philippinensis* Kieffer are identical; and Macfie (1937) stated that these are all identical with *peregrinus* Kieffer.

#### 102. *Culicoides peliliouensis* Tokunaga (fig. 76, b, c).

*Culicoides peliliouensis* Tokunaga, IN Tokunaga and Esaki, 1936, Mushi 9 (1): 55 (Palau).—Tokunaga, 1937, Tenthredo 1 (3): 305; 1940, Tenthredo 3 (2): 181.

Small, yellowish-brown with brown markings, scutum with three brown vittae, scutellum yellow, postscutellum dark brown; legs obscurely banded; wing very sparsely hairy, with pattern of many large round and oval light spots, second radial cell mainly in a light spot.

*Female*: Body length 1-1.5 mm. Wing about 1-1.2 mm.

Head yellowish-brown, with vertex brown. Eyes very narrowly separated above by less than half a facet. Mouthparts pale brown, maxillary palp with segments in proportion of 10:21:26:13:13; segment 3 with two to four groups of sensillae on distal part; clypeus with three pairs of setae. Antenna pale brown; AR 1.06 to 1.11; distal eight segments in proportion of 8:7.7:7.5:14:13.5:14:15:20.

Thorax yellowish brown in ground color; scutum with pair of large, brown lateral vittae, short, brown median vitta which narrowly extends cephalad, and obscure brown cloud between yellow humeral pits; scutellum yellow and with two pairs of setae; post-scutellum dark brown. Legs almost entirely pale brown to yellowish brown; knee joints of fore and hind legs dark brown; femora sometimes obscurely paler preapically; leg segments, except for coxae and trochanters, in proportion of 25.5:25:12.8:5.8:3.5:2.8:3.5 in fore leg, 33.5:33:18.3:6.3:3.6:2.6:3.3 in middle leg, and 29.8:30:15.3:7.5:4.3:3.3:3.9 in hind leg.

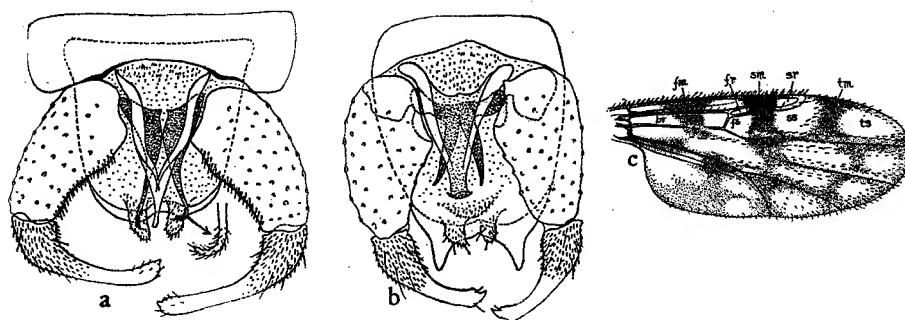


FIGURE 76.—a, *Culicoides peregrinus*, hypopygium and tip of paramere, male. b, c, *C. pelikouensis*: b, hypopygium, male; c, wing, female. (br: basal radial cell, fm: first costal dark spot, fr: first radial cell, fs: first costal pale spot, sm: second costal dark spot, sr: second radial cell, ss: second costal pale spot, tm: third costal dark spot, ts: third costal pale spot).

Wing about three times as long as wide, with veins yellow in light spots and dark brown in dark clouds; macrotrichia on radial veins,  $M_1$ ,  $M_2$ ,  $M_{3+4}$ ,  $Cu_1$ , and at tip of  $Cu_2$ ; membrane with sparsely distributed macrotrichia in cell  $R_5$ ,  $M_1$ ,  $M_2$ ,  $M_4$ , and anal cell, line of trichia extending above  $M_1$ , below  $M_{1+2}$  and  $M$ , and above  $M_{3+4}$  and stem of  $Cu_1$ . Wing markings: Dark band arising from end of  $R_1$ , extending caudad, and ending at tip of  $Cu_1$ ; zigzag dark band arising from anterior margin slightly beyond tip of  $R_5$ , extending caudad, and ending at tip of  $Cu_1$ . Between these bands, many oval or round light spots arranged as follows: Large spot covering arculus and bases of  $R$  and  $M$ , irregular spot at basal corner of anal cell, large round spot centered on r-m, large round spot covering distal two-thirds of second radial cell at middle part of cell  $R_5$ , large oval spot at distal part of cell  $R_5$ , an elongate spot above fMCu, similar spot at basal half of cell  $M_1$ , small round spot at distal one-third of cell  $M_1$ , narrow spot above  $M_{3+4}$ , small oval spot at distal end of cell  $M_2$ , double small spot before  $Cu_1$  in anal cell, and suboval large spot in cell  $M_4$ . Haltere white.

Abdomen yellowish brown, with sternite 8 somewhat darker; cerci white; two spermathecae dark brown, round, subequal, with short chitinized duct; other spermathecae vestigial and irregular in shape.

*Male*: Body slightly smaller than female. Wing about 1 mm. by 0.35 mm. Coloration

somewhat paler than in female especially in the wing marking. General structure and coloration similar to those of female except for usual sexual differences.

Head with eyes separated above as wide as 1.2 times width of facet; clypeus with three pairs of setae; maxillary palp with segments in proportion of 6:10:15:8:10; segment 3 somewhat fusiform and with small sensory pore beyond middle. Antenna with scape brown, short basal flagellar segments yellowish white and three long apical segments brownish yellow; ultimate segment swollen basally, tapering distally, and ending in rather pointed tip; proportion of distal seven segments about 10:10:11:12.5:30:23.5:23.5; segments 2 to 10, 2 to 11, 11 to 14, and 12 to 14 in proportion of 121:133:93:80.

Thorax mainly brown, faintly paler on humeral pits, and with pale slender vittae along pseudosutural lines; scutellum with pair of middle bristles and two lateral bristles and several minute accessory setae between paired long bristles. Legs with pale rings before and beyond knee joints of fore and middle femora, but hind femora without pre-apical rings; proportion of leg segments 115:102:51:22:14:10:12 in fore leg, 140:132:78:25:14:10:13 in middle leg, and 120:115:58:30:17:10:13 in hind leg.

Wing with two distinct radial cells, macrotrichia very sparse, found only along marginal areas of cells  $R_5$  and  $M_1$ ;  $R_s$  ending at level of tip of  $Cu_1$  and  $fMc_u$  just beyond anastomosing point of  $R_1$  and  $R_s$ . Haltere white.

Hypopygium brown, tergite 9 elongate, gradually narrowed caudad, both sides evenly curved, ending in paired anal points, caudal margin shallowly incised into V-shape, anal points with basal half broad and suddenly tapering into horn-like projections. Sternite 9 narrowly transverse, with caudal margin shallowly concave in V-shape, caudal membrane with spinules; coxite about twice as long as basal width; style shorter than coxite, somewhat basally swollen, evenly curved, and tapering, but not very slender and each ending in minute sharp point; aedeagus elongate, triangular, both sides slightly curved, basal roots rather short, and tip truncate and curved ventrad; parameres far shorter than aedeagus, sword-like, and hyaline, mesally fused at base, basal roots rather large and extended laterad.

#### DISTRIBUTION: Caroline Is.

PALAU. BABELTHUAP: Ngiwal, May 1957, Sabrosky; Ngeremlengui, June 1957, Sabrosky. NGAIANGL: Male, May 1957, Sabrosky. PELELIU: Male (CM), allotype, mounted in Gater's solution, Aug. 1945, Hagen; two females, two males, same data as for allotype; 40 females, three males, Aug. 1945, Dybas; female, Aug. 1945, Baker; two females, two larvae, 1946, Dorsey; May 1957, Sabrosky. ANGAUR: Dec. 1944, Dybas.

YAP. RUMUNG: Female, June 1957, Sabrosky. YAP: Female, May 1936, Kondo; North Yap I., two females, July 1950, Goss; Kolonia, female, June 1957, Sabrosky.

TRUK. WENA: Two females, Dec. 1945, Ingram; many females, at dusk, at light, bit man, Feb. 1948, Maehler. TON: Seven females, bit man, May 1946, Townes; 171 females, at light, Apr. 1949, Potts; Mt. Unibot, female, Dec. 1952, Gressitt.

PONAPE. Nanipil, female, Mar. 1948, Dybas.

This species is extremely abundant and troublesome in the Palau Islands. The immature forms are found in the mangrove swamps surrounding the islands. Females bite man severely in the house and field at dusk. This species may be distributed more widely in the Caroline Islands.

**103. *Culicoides esakii* Tokunaga (fig. 77, a, b).**

*Culicoides esakii* Tokunaga, 1940, Philippine Jour. Sci. 71 (2): 217 (Ponape).—Esaki, 1940, Philippine Jour. Sci. 71 (2): 227 (Ponape).—Tokunaga, 1940, Tenthredo 3 (2): 178 (Caroline Is.); 1941, Annot. Zool. Japon. 20 (2): 112 (Truk).

Minute, yellow; in dry state, thorax brownish and with yellow and dark-brown marking; in mounted or alcoholic specimens, scutum yellow or pale yellowish brown, with somewhat variable dark-brown or brown marking; in paler specimens, paired, small dark-brown stripes arise from anterior margin, extend caudad along foveae, and end midway of scutum; in darker specimens, broad brown areas cover almost entire surface of scutum, yellow parts are reduced to round oval spots. Legs mainly pale brown to yellowish and banded obscurely. Wing with light spots similar to those of *C. peliliouensis* Tokunaga, but dark areas more extensive.

*Male*: Body length about 1 mm. Wing about 0.65 mm. by 0.25 mm. General structure and coloration similar to those of female, except for usual sexual differences.

Maxillary palp moniliform; segment 3 with sensory pore which consists of short, spoon-like sensillae in shallow depression. Antennal segments 8 to 14 in proportion of 10:10:9:9:25:21:27. Legs brownish, with broad paler rings before and beyond knee joints; hind tibia broadly paler apically.

Wing with macrotrichia very sparse, trichia of membrane arranged in line above distal part of  $M_1$  and along distal margin of cell  $R_s$ , cell  $M_1$  with only three or four trichia along distal margin. Wing markings: Third dark costal band broad in cell  $R_s$ , middle dark band of cell  $M_1$  shifted slightly distad from level of cell  $R_s$ , second dark costal band covering distal half of first and basal half of second radial cell. Venation: First radial cell narrow and about half of second cell in length, second radial cell broad and pointed distally, fMCu, forking point between  $M_1$  and  $M_2$ , and r-m on same level.

Hypopygium with tergite 9 somewhat square, truncate at caudal margin, and with pair of small conical anal points at caudal angles; coxite subcylindrical and not distinctly tapered; style slender, very slightly arcuate, tapered, but slightly swollen apically, and slightly curved before apex; aedeagus triangular, slender at caudal tip, and with pair of slender, lateral chitinated plates; parameres slender, long, irregularly curved, and palmate into six fine threads at each tip.

*Female*: Body length about 1.42 mm. Wing about 0.75 mm. by 0.31 mm.

Head yellowish brown, with mouthparts pale brown. Clypeus with two pairs of marginal setae. Eyes narrowly separated above. Maxillary palpal segments in proportion of 3.9:10.7:12.2:6.3:5.8. Antenna almost entirely pale brown; AR about 1.22 (1.16-1.27); distal eight flagellar segments in proportion of 8.1:8.2:8.5:13:13.1:14.3:15.8:22.9.

Thorax, in dry state, pale brown and slightly shining, scutum brown on anterior margin, dark brown on lateral halves and with three pale-brown obscure round spots on anterior half of lateral side, median part with pair of large, oval yellow spots on anterior half and large dark-brown longitudinal cloud at middle of caudoscuteal area, scutellum brown and postscutellum dark brown. In alcoholic state, scutum generally yellow, with brown anterior and lateral margins, pair of irregular brown stripes along foveae which arise from anterior margin and reach to scutellum, at center of scutum small rhombic brown cloud, small obscure cloud along caudal margin of caudoscuteal area, lateral part between brown stripe and lateral margin with large, yellow obscure spot at humeral area and elongate large yellow spot at middle; scutellum yellow, with median brown cloud and brown lateral corners, postscutellum yellow, with pair of brown clouds on caudal half. In paler specimens, scutum only brownish along anterior margin, along anterior halves of longitudinal foveae, and along caudal margin of caudoscuteal area and central rhombic cloud very obscure. In darker specimens, scutum brown and with distinct yellow spots: two small spots at each humeral area, two oval spots at anterior half of median area between foveae, subconfluent round and large elongate oval spot on lateral side

laterad of foveae, two separate, small, comma-shape spots on anterior part of caudoscuteal area, scutellum brown, with pair of small, round yellow spots, postscutellum brown, with crescent-yellow spot along anterior margin. Thorax with yellowish-brown setae; scutellum with two pairs of strong bristles and two pairs of small accessory setae between pairs of bristles. Legs brown to yellow and banded; coxae and trochanters of legs brown to pale brown, tarsal segments yellow or yellowish white; tibiae and femora mainly brown and with yellow band; in fore and middle legs, basal tips, apical half or one-third of femora, and basal half of tibiae yellow; in hind leg, basal tip of femur and basal and apical one-fourth of tibia yellow; knee parts of fore and middle legs yellow and those of hind legs dark. Tarsal spurs: Tarsal segment 1 with basal and apical spur; that of fore leg with three additional spur-like bristles on middle part; tarsal segments 2 and 3 of fore and middle legs with one or two apical spurs; other tarsal segments without distinct spurs. Leg segments, except for coxae and trochanters, in proportion of 76.5:73.2:37.8:14.2:10.4:7.5:10.1 in fore leg, 96.3:93.8:52:15:11.7:8.3:10.3 in middle leg, and 89.2:85:40.6:17.8:12.3:8.8:11.2 in hind leg.

Wing very sparsely hairy, with pattern of round and oval light spots as in *C. peliliouensis*, distal one-third of second radial cell in light spot. Venation: Costa ending about three-fifths of wing, first radial cell about half length of second cell,  $M_{1+2}$  subequal to r-m, fMCu just beyond origin of r-m, stem of fMCu undulate, base of  $M_2$  obscure,  $M_{3+4}$  longer than twice of distal section of  $Cu_1$ . Macrotrichia of membrane: In cell  $R_5$  distributed on anterior half of distal area, in line above distal two-thirds of  $M_1$ ; in cell  $M_1$  very sparse on distal half, in line below distal two-thirds of  $M_1$ ; in cell  $M_4$  several trichia on anterior and posterior part of distal area; in cell  $M_4$  four or several along caudal margin; and in anal cell trichia absent or one or two present on distal corner. Wing pattern: Broad basal light spot enveloping arculus and extending caudad along wing margin; dark irregular basal band extending from costa to middle part of anal margin of anal cell, enveloping middle parts of veins R, M, and stem of fMCu; first light costal spot enveloping r-m, distal one-fourth of R, and basal half of first radial cell; second dark costal spot extending from costa to  $M_{1+2}$ , enveloping distal half of first radial cell and basal two-thirds of second radial cell; second light costal spot large, round, enveloping distal one-third of second radial cell, and sometimes this spot partially invaded at middle of distal margin by small triangular extension of third dark costal spot; third dark costal spot usually narrower than apical light spot of cell  $R_5$  and extending from costal margin to middle part of  $M_2$ , forming distinct dark band; third light costal spot oval, usually broader than third dark spot and occupying distal corner of cell  $R_5$ ; light spot between  $M_{1+2}$  and distal one-third of stem of fMCu rather large and usually round; double light spot at distal part of anal cell before  $Cu_1$ ; oval light spot at basal one-third of cell  $M_1$ ; large oval light spot at distal half of cell  $M_2$ ; semicircular light spot at distal end of cell  $M_2$ ; similar light spot on distal two-thirds of cell  $M_4$ ; bare and pale linear areas along both sides of  $M_1$  distinct, in darker specimen, third dark band broad, in cell  $R_5$  as wide as third light costal spot, extending broadly caudad, and continuous with square dark spot on  $Cu_1$ , thus two light spots in cell  $M_1$  and light spot under  $M_{1+2}$  reduced to small oval spots. Haltere brown to dark brown.

Abdomen yellowish white; uniformly or broadly brown on lateral side. One spermatheca, large, oval, yellowish brown or brown, with short, pale-brown chitinized duct; one minute, brown, and tubular; one minute, brown, and oval; brown, minute ring-like structure on common duct.

#### DISTRIBUTION: Caroline Is.

PALAU. BABELTHUAP: Ulimang, female, Dec. 1947, Dybas.

YAP. GAGIL-TOMIL: Tomil Distr. two females, July 1950, Goss.

PONAPE. Mt. Dolen Nankep, female, in rain forest, Aug. 1946, Townes; female, Jan. 1948, Hurlburt; Nanipil, four females, Feb., Mar. 1948, Dybas; Mt. Nahnalaud, 152-457 m. northwest slope, two females, Mar. 1948, Dybas;

Net District, ten females, biting man, Mar. 4, 1948, Dybas; Mt. Temwetem-wensekir, 180 m., seven females, Jan. 1953, Gressitt and Clarke; Mt. Ngihneni, 770 m., female, Jan. 1953, Gressitt; southeast Nanpohnmal, female, Jan. 1953, Gressitt.

KUSAIE. Female, 520 m., Aug. 1946, Townes; Mutunlik, seven females, three males, light trap, Jan. 1953, Gressitt; Mutunlik, 20 females, three males, Jan.-Mar. 1953, Clarke; Mutunlik, 300 m., female, light trap on hill, Mar. 1953, Clarke; Pukusrik, five females, light trap, Apr. 1953, Clarke; Mwot, two

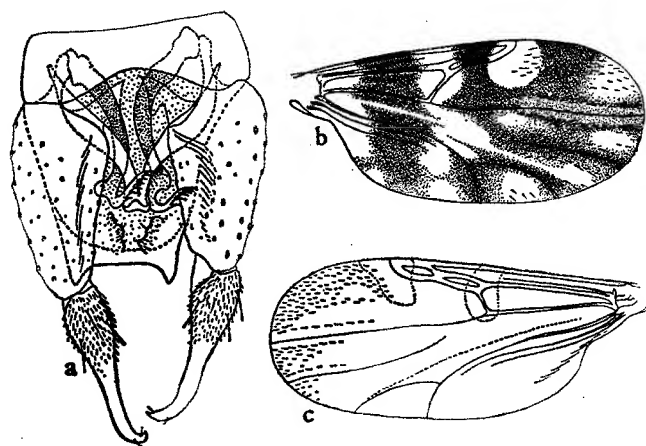


FIGURE 77.—a, b, *Culicoides esakii*: a, hypopygium, male; b, wing, female. c, *C. obscurus*, wing, female.

females, light trap, Apr. 1953, Clarke; Hill 1010, female, male, Apr. 1953, Clarke.

This species was first collected from Ponape and then from Truk by Professor T. Esaki's Micronesian Expeditions, and was thought to be restricted to the eastern parts of the Caroline Islands. According to Esaki, this minute midge is well known among the natives and residents in Ponape and is abundant and troublesome throughout the forest in the mountainous regions, attacking men in the daytime.

**104. *Culicoides obscurus* Tokunaga and Murachi, n. sp. (fig. 77, c).**

Small, brown; wing with very obscure light spots as in *C. obsoletus* Meigen; scutum almost uniformly brown and mat; scutellum with only three long bristles and without small accessory setae; legs mainly brown, but femoral bases and basal one-fifth of hind tibia paler; haltere pale brown.

*Female*: Body length about 1.36 mm. Wing about 1.09 mm. by 0.43 mm.

Head all brown, with eyes contiguous above; clypeus with two pairs of long setae. Maxillary palp rather slender; segment 3 fusiform and with sensory pore beyond middle; five segments in proportion of 4:16:16.5:8:9. Antenna entirely brown; AR equals 1.32

(1.2-1.43); distal eight flagellar segments in proportion of 11.5:12:14:22.5:21.5:22:23:37.5.

Thorax almost uniformly brown, with scutum mat; scutellum with median bristle and pair of long lateral bristles, no small accessory setae. Legs almost uniformly brown, but bases of femora and basal one-fifth of hind tibia paler; leg segments from femora to tarsal segment 5 in proportion of 95:92:50:18:13:9:13 in fore leg, 114:113:63:21:15:9:14 in middle leg, and 110:108:54:26:16:11:13 in hind leg; hind TR equals 2.05 (1.85-2.25).

Wing fuscous, darker on costal area, and pale gray on caudal area. Obscure light spots: First and second costal spots rather more distinct than others; first spot small, somewhat concave toward wing base, enveloping r-m, basal one-third of first radial cell, and adjacent parts of costal and median veins; second costal pale spot rather large, arising from costal margin, extending caudad, gradually narrowed, ending around margin before vein  $M_1$ , and enveloping distal half of second radial cell; other light spots very obscure and diffuse, almost disappearing in mounted specimen; cell  $R_5$  paler on distal area; cell  $M_1$  with two oblong paler spots, one at basal one-third and one at distal one-third; cell  $M_2$  with semicircular spot on distal area; cell  $M_4$  with similar spot on distal half; anal cell with round spot before fMCu; oblong spot between  $M_{3+4}$  and fold above stem of fMCu; base of wing including arculus broadly paler. Macrotrichia very sparse, distributed around costal margin of cell  $R_5$ , along distal tip of cell  $M_1$ , and several trichia in line along distal margin of cell  $M_2$  and above distal one-third of  $M_1$ . Venation:  $R_1$  ending just beyond tip of  $Cu_1$ ,  $R_s$  ending far before tip of  $M_{3+4}$  and at basal seven-tenths of wing, base of  $M_2$  narrowly atrophied, fMCu under junction of two radial cells, fMCu about 90-degree angle,  $Cu_1$  strongly curved and about half as long as  $M_{3+4}$ .

Abdomen brown, with tergites somewhat square, sternites reduced to paired patches; cerci brown. Two spermathecae brown, subspherical, equal, with short chitinized duct; one minute, clavate, and brown.

*Male*: Unknown.

Holotype, female (US 64043), Ngaremeskang, Babelthuap I., Palau Is., 30 m., light trap, Dec. 24, 1952, Gressitt. Paratypes, three females (BISHOP), same data as for holotype; female (BISHOP), southwest Koror, Palau, 25 m., light trap, Dec. 5, 1952, Gressitt.

Other specimens, Palau: Three females, Ngerehelong Pen., Babelthuap, June 3, 1957, Sabrosky; Imeliik, Babelthuap I., June 1957, Sabrosky; two females, Ulimang, Babelthuap, Dec. 13, 1947, Dybas; two females, Ngaremlengui, Babelthuap, light trap, June 4, 1957, Sabrosky; Koror, May 1957, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau).

This species is closely allied to *C. obsoletus* Meigen which is common in the Palearctic and Nearctic regions; but in *obsoletus*, the scutellum has four long setae, the legs are uniformly brown and without pale bands, and the inner angle of fMCu is less than 90 degrees, distinctly differing from this species.

#### 105. *Culicoides palauensis* Tokunaga, n. sp. (fig. 78).

Small, brown; wings very closely similar to those of Micronesian *C. esakii* Tokunaga in wing marking, distribution of macrotrichia, and venation. Maxillary palp with small sensory pore on segment 3. Antenna with basal short segments round to short-oval; AR about 1.18. Thorax brown to dark brown, without yellowish spots; scutellum with three bristles. Legs mainly pale brown, with yellowish bands before or beyond knee joints; hind TR about 1.97. Two spermathecae well developed, round and subequal.



*Female*: Body length about 1.0 mm. Wing about 0.77 mm. by 0.34 mm. Coloration generally brown, wings with large pale spots and very sparse macrotrichia on apical margin.

Head brown, with proboscis about 0.6 as long as length of head capsule (9:16), clypeus with four lateral setae. Maxillary palp pale brown, segment 3 elongate, oval, shorter than 2, with small sensory pore on preapical part, five segments in proportion of 4:11:9:6:6. Antenna with scape and apical elongate segments brown, basal short segments pale brown (not yellow), spherical to short-oval; AR about 1.18; relative length of segments, except for basal one, about 7:5.5:5.5:6.5:6.5:7:7:10:10:11:10.5:17.5.

Thorax almost entirely brown to dark brown; scutum brown, with dark-brown obscure clouds along anterior margin and on foveae; scutellum with three strong bristles and without minute setae. Legs mainly pale brown, trochanters and basal parts of femora very pale and tarsi entirely yellow, knee joints dark; in fore leg, knee part with distinct

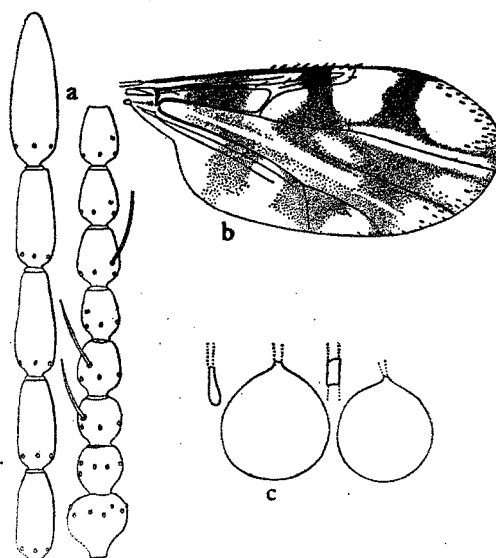


FIGURE 78.—*Culicoides palauensis*, female: a, flagellar antennal segments; b, wing; c, spermathecae and basal rings.

yellow bands before and beyond joint; in middle leg, femoral and tibial end parts obscurely very pale and tibial sub-basal part yellow; in hind leg, tibial sub-basal and apical parts broadly yellow; hind TR about 1.97; relative length of leg segments, except for basal two, about 70:66:31:13:10:8.5:9 in fore, 85:83:46:16:11:8:10 in middle, and 84:81:35.5:18:11:7:10.5 in hind leg.

Wing with very sparse macrotrichia along apical margin, short lines of macrotrichia along apical end of vein  $M_1$ ; pale spots large, second costal dark spot narrow and covering apical one-third of first and basal half of second radial cell, second costal pale spot covering apical half of second radial cell, large, but not reaching  $M_1$ , third costal pale spot very large, occupying about apical one-third of cell  $R_5$ , pale lineal spot covering distal two-thirds of  $M_1$ , basal pale spot of cell  $M_1$  oblong and situated on basal end of cell, marginal pale spots broadly touching anal margin, third costal dark spot narrow and as large as second, wing base widely pale. Venation: Costa ending at basal 0.6 of wing length

(35.5:57.5) and distinctly before level of tip of  $M_{3+4}$ ,  $R_s$  about 1.4 times as long as  $R_1$  (13:9) and ending before middle of second costal pale spot, second radial cell subtriangular, rather small and little shorter than slit-like first cell (5:6), relative length of  $R$ ,  $M$ , and stem of  $fMCu$  about 17:16:27.5,  $fMCu$  before end of first radial cell,  $M_{3+4}$  not deflected from its stem, very slightly arcuate and a little longer than twice of  $Cu_1$  (15:6.5). Haltere entirely yellow.

Abdomen entirely pale brown, with tergites reduced into oval and cordate sclerites, sternites highly reduced, cerci yellow; two spermathecae, brown, round, subequal (1+12.5 by 13 units and 0.5+9 by 9 units) and each with minute neck part, one vestigial (4 by 1.5 units).

Holotype, female (US 64612), Ngaremlengui, Babelthuap I., Palau Is., June 3, 1957, light trap, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau).

This is very closely allied to *C. esakii* Tokunaga but in that species the scutum is adorned with distinct yellow spots and there is only one well-developed spermatheca, differing from the present new species.

#### Genus *Ceratopogon* Meigen (1803)

*Helea* Meigen (1800), *Brachypogon* Kieffer (1899), *Psilohela* Kieffer (1917), *Isohela* Kieffer (1917), *Anakempia* Kieffer (1924) and *Fanthamia* de Meillon (1939).

Body rather stout and with setae short and very scanty. Eyes more or less pubescent. Female antenna with basal short flagellar segments round or short-oval and apical five more or less elongate, but not very long. Male antenna with apical three segments distinctly elongate. Scutum with humeral pits, though sometimes very small. Legs rather slender, without long bristles or stout spines; tarsal segment 4 short, but not cordiform; empodia very small or absent; claws of female rather large, equal or subequal. Wings oval, milky-white in dry state owing to absence of macrotrichia on membrane, macrotrichia quite absent or reduced to a few along the apical margin. Venation: Costa ending at middle or somewhat beyond middle of wing length, two anterior radial cells normally present and about equal in size, but often reduced and sometimes one or both of them absent; cross vein  $r-m$  not very oblique; intercalary fork indistinct; median fork with rather long stem, but  $M_2$  widely interrupted or sometimes quite absent. Alula and squama bare. Male hypopygium not inverted; parameres separated.

This genus is subdivided into four subgenera: *Ceratopogon* (s. str.), *Isohelia*, *Brachypogon* and *Trisohelea*, based mainly on the development of two anterior radial cells and vein  $M_2$ . Although this subgeneric system is convenient, there are many inter-subgeneric species which show transitional characters of wing venation, and the subgenera are not considered in this paper.

#### 106. *Ceratopogon insuliculus* Tokunaga, n. sp. (fig. 79).

Small, brown. Eyes entirely pubescent. Antenna of female without terminal stylets, AR about 1.05. Scutum entirely brown; scutellum with only four bristles. Legs mainly brown, with ill-defined yellowish or paler parts; fore and hind legs with claws simple, but middle leg with characteristic claws, each bearing minute tooth on either side of base; hind TR 2.06. Wing milky white in dry specimen, with veins dark brown;  $R_1$  and  $R_s$  fused completely, no radial cells, dark square stigma-like spot covering tips of radial vein and costa,  $M_2$  completely atrophied. Abdomen with sternites subcordiform and small,

tergites each with pair of hyaline spots; single spermatheca, long, subpyriform and with very minute hyaline dots on basal part.

*Female*: Body length about 1.14 mm. Wing about 0.7 mm. by 0.29 mm. General coloration brown, but wing milky white in dry specimens and legs with ill-defined paler and yellowish parts.

Head dark brown, with mouthparts brown, proboscis small and about one-third as long as head capsule, eyes entirely pubescent and just contiguous above; clypeus with four setae; mandibles slender and each with eight teeth which gradually increase in size

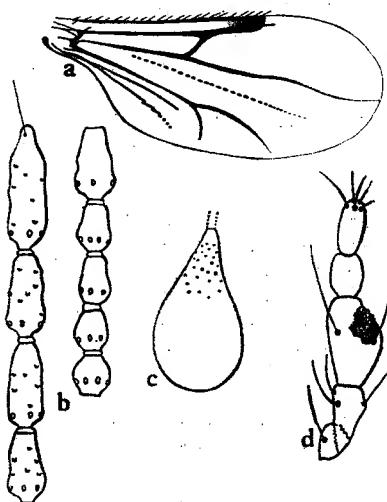


FIGURE 79.—*Ceratopogon insulicolus*, female: a, wing; b, distal nine flagellar antennal segments; c, spermatheca; d, maxillary palp.

toward apex. Maxillary palp stout, segment 3 with large and rather deep sensory pore on apical half, five segments in proportion of 4:7:10:5:6. Antenna with basal short flagellar segments spherical and gradually elongate toward apex forming short-oval, apical five segments elongate-oval, no terminal stylets; AR about 1.03-1.06; relative length of distal nine segments about 5:5.8:6:6:8.8:8.8:10.3:10.5:15.8.

Thorax entirely brown; scutellum with four bristles and without accessory setae. Legs mainly brown, but tarsi largely very pale brown, knee joints dark, distal parts of all tibiae more or less yellowish, trochanters pale brownish yellow, tarsal segment 1 of hind leg brown; tibial comb of hind leg with seven apical bristles; claws rather large, slightly arcuate, equal, about two-thirds or three-fifths as long as last tarsal segment, each claw of middle leg with very minute teeth on either side of base; tarsal segment 4 slightly cordiform, segment 5 clavate, narrowed at base; hind TR about 2.06. Relative length of leg segments, except for basal two, about 78:75:27:15:10:7:15 in fore, 99:92:47:21:14:8:15 in middle, and 90:77:35:17:11.5:8:15 in hind leg.

Wing with veins brown, stigma-like spot at end of costa dark, macro- and microtrichia quite absent. Venation:  $M_2$  completely atrophied,  $R_1$  and  $R_s$  entirely fused, forming one vein,  $M_1$  slightly sinuous, costa ending distinctly beyond middle of wing (35:54) and slightly before level of tip of  $M_{3+4}$ , relative length of R, M, and stem of fMCu about 19:17:21, fused radial vein squarely curved at end and about half as long as R (9.5:19), r-m about half as long as fused radial vein,  $M_{3+4}$  about twice as long as  $Cu_1$  (15:7), fMCu under middle of r-m. Haltere white.

Abdomen with tergites brown, subsquare and each with pair of small hyaline spots, sternites reduced into small subcordiform plates and pale brown, pleural membranes with fine dark striation; cerci pale brownish yellow; single spermatheca, elongate, subpyriform (25 by 16 units) and with minute hyaline dots on basal part.

*Male:* Unknown.

Holotype, female (US 64613), Gagil Distr., Yap I.; at light, June 19, 1957, Sabrosky.

DISTRIBUTION: Caroline Is. (Yap).

### Genus *Alluaudomyia* Kieffer (1913)

*Neoceratopogon* Malloch (1915), *Prionognathus* Carter, Ingram, and Macfie (1921), *Thysanognathus* Ingram and Macfie (1922), and *Isoecacta* Garrett (1925).

Body moderately slender, not strongly hairy, usually small, about 1 to 2 mm. long. Eyes hairy or bare, narrowly separated above. Male antenna with plumose hairs, last three segments long and preceding two segments somewhat longer than basal flagellar segments, but far shorter than distal three. Female antenna 14-segmented, distal five segments long. Wing usually with macrotrichia toward apex but in male often without macrotrichia, microtrichia of wing absent,  $R_1$  and  $R_s$  anastomosing basally, thus first radial cell absent,  $R_s$  ending at or beyond middle of wing and thickened at tip, fork of  $M_{1+2}$  petiolate; wing often adorned with small, dark or brownish spots. Legs slender, without spines; claws of female hind legs highly unequal, inner claw fully as long as tarsal segment 5 and far longer than outer claw: empodium vestigial.

### KEY TO MICRONESIAN SPECIES OF *ALLUAUDOMYIA*

1. Wing with few dark spots on anterior veins..... 2  
     Wing with many dark spots on radial and other veins and in wing cells.....107. *maculosipennis*
2. Wing with single dark spot at end of  $R_s$ .....108. *monopunctata*  
     Wing with two or three dark spots..... 3
3. Legs with knee joints distinctly dark brown. Wing with two dark spots: one covering distal parts of  $M$  and  $R$ , and one at distal part of second radial cell.....109. *bipunctata*  
     Legs with knee joints not distinctly dark brown..... 4
4. Wing with three dark spots: one covering tip of second radial cell, one on distal part of anastomosing vein of  $R_1$  and  $R_s$ , and one covering distal parts of  $R$  and  $M$ .....110. *insulana*  
     Wing with two dark spots: one covering tip of second radial cell, and one covering distal parts of  $R$  and  $M$ ; anastomosing vein of  $R$  and  $M$  without dark spot.....111. *insulicola*

### 107. *Alluaudomyia maculosipennis* Tokunaga.

*Alluaudomyia maculosipennis* Tokunaga, 1940, *Tenthredo* 3 (2): 181 (Ponape).

Small, yellowish-brown, punctate with banded and mottled legs; wing with more than 15 small black spots.

*Male:* Body about 1.8 mm. long. Wing about 1.0-1.1 mm. by 0.4-0.5 mm.

Head brown. Eyes separated on vertex. Antenna uniformly brown; distal six segments in proportion of 12:12:19:39:25:32.

Thorax yellowish white; scutum not shining, with pair of dark narrow stripes along foveae, caudoscuteal area dark brown, anterior end dark, humeral areas pale brownish white, lateral anterior parts with pair of broad short brown bands just caudad of humeral white areas, many dark dots spread over surface; scutellum dark, with median and, in many specimens, additional paired pale-yellow spots; postscutellum dark brown; pleural side with distinct, dark-brown stripe arising from neck and ending at abdominal base. Legs yellowish white, with distinct dark rings: femur with preapical and dark median ring; tibia with sub-basal, median, and apical ring; tarsal segment 1 with basal and dark apical ring, trochanter with small brown cloud; median ring of fore femur broader than in other legs; claws simple, equal, small.

Wing with many small, dark-blue spots, number somewhat variable; one spot just before r-m, one just beyond r-m, one at tip of  $R_s$ , one or two subconfluent spots in distal half of cell  $R_s$ , one in cell  $M_1$ , one on basal part of  $M_2$ , one just above tip of  $M_{3+4}$ , two in cell  $M_4$ , one above fMCu, four in anal area, and one at each tip of  $M_2$ ,  $M_{3+4}$ , and  $Cu_1$ ; macrotrichia rather sparse, present on distal half. Venation:  $R_s$  extending beyond middle of wing (30:57),  $R_s$  fused with  $R_1$  on its basal two-thirds, proportion of  $R_s$  and  $R_1$  about 74:50; fMCu under tip of  $R_1$ , basal part of  $M_2$  obscure. Haltere white.

Abdomen white; tergal sclerites brown; tergite 1 brown and square; 2 with pair of small stripes and U-shape median spot; other tergites with pair of small brown clouds on anterior margin; sternites with paired brown patches. Hypopygium yellowish brown, with coxite somewhat cylindrical and simple; style rather strong, diameter subequal to tip, slightly curved, with small blunt tooth at apex.

*Female*: Body length about 2 mm. long. Wing about 1.17-1.2 mm. by 0.44-0.5 mm. General structure similar to male with usual sexual differences.

Head yellowish on occipital region around eyes, yellowish white between eyes on frontal aspect. Antenna yellowish brown, but scape yellow, elongate distal neck parts of basal segments and entire long distal segments dark; AR about 0.84; proportion of distal seven segments about 18:19:22:22:23:21:28.

Thorax with brown ground color on sclerites; legs with median rings of femora and tibiae of fore and middle leg far broader than in male; claws simple, unequal.

Wing with anterior veins yellow;  $M_1$ ,  $M_2$ ,  $M_{3+4}$ , and  $Cu_1$  dark brown; vein  $R_s$  extending far beyond tip of  $Cu_1$ .

Abdomen with paired brown markings on tergites.

**DISTRIBUTION**: Formosa, Caroline Is.

PALAU. BABELTHUAP: Ngerehelong Pen., female, four males, May 1957, Sabrosky; Ngiwal, male, light trap, May 1957, Sabrosky; Ngaremlengui, two males, light trap, June 1957, Sabrosky; Melekeiok, female, male, June 1957, Sabrosky. KOROR: Eight females, at light, Aug., Sept. 1952, Beardsley; six females, Jan., Mar., Apr. 1953, Beardsley; female, nine males, light trap, May 1957, Sabrosky; female, six males, July, Aug. 1957, Sabrosky; southwest part, many males and females, light trap, Dec. 1952, Gressitt.

YAP. RUMUNG: Male, June 1957, Sabrosky. YAP: Hill behind Yaptown, many males and females, light trap, Nov.-Dec. 1952, Gressitt; Kolonia, two females, five males, light trap, June 1957, Sabrosky. GAGIL-TOMIL: Gagil Distr., male, light trap, June 1957, Sabrosky.

From Formosa, Okada (1942) recorded a male of this species, in which tarsal segment 1 of the hind leg has no basal dark ring and veins  $M_2$ ,  $M_{3+4}$ , and  $Cu_2$  have no dark spots at tips.

108. *Alluaudomyia monopunctata* Tokunaga and Murachi, n. sp. (fig. 80).

Small, yellowish; scutum with three, obscure yellow vittae; legs yellow to brown, but without distinct markings and knee joints yellowish; tarsal segments 3 and 4 of middle leg distinctly obcordate; wing with only one dark spot at tip of Rs, macrotrichia spread over distal one-third of wing membrane.

*Female*: Body length about 1.63 mm. Wing about 1.09 mm. by 0.45 mm.

Head brown; eyes separated above as wide as one and a half facets. Mouthparts pale brown; clypeus with three setae along each side; maxillary palp broken off. Antenna with scape brown; following parts broken.

Thorax largely pale yellow; scutum with short, obscure yellow vitta on middle of anterior part and two similar vittae on posterior half; scutellum yellow and with pair

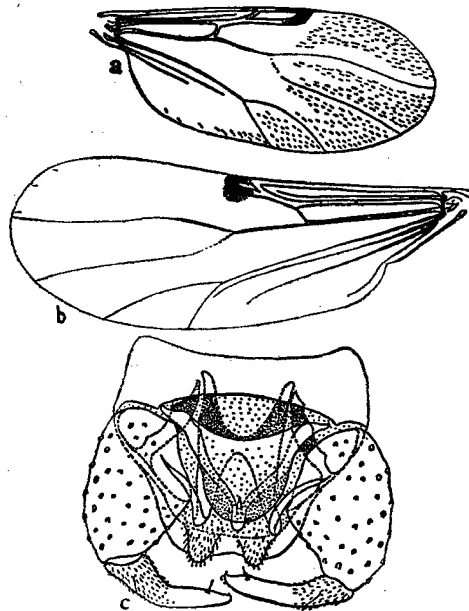


FIGURE 80.—*Alluaudomyia monopunctata*: a, wing, female; b, wing, male; c, hypopygium, male.

of lateral setae; postscutellum uniformly yellow. Legs mainly yellowish but fore leg more brownish; in fore leg, coxa, trochanter, apical one-third of femur and basal one-third of tibia yellow and other parts and segments brown; in middle leg, coxa with brown cloud on lateral side, femur with brown dorsal cloud on basal half, tarsal segments 4 and 5 entirely brown, other parts and segments yellow; in hind leg, distal end of tibia and tarsal segment 1 brown and other parts yellow; middle leg with tarsal segments 3 and 4 equally obcordate; claws bifid, shorter one as long as tarsal segment 5 and longer one far longer than other tooth (30:25). Leg segments in proportion of 113:110:42:24:9:12:29 in fore leg, 162:151:82:33:13:12:20 in middle leg, and 126:119:56:21:11:10:23 in hind leg. Tarsal apical spurs in fore leg, basal two segments each with two and following two each with one; in middle leg, segments 1 to 4 each with one; and, in hind leg, segments 2 to 4 each with one distinct spur.

Wing white, with single dark spot on apical end of  $R_s$  and adjacent part of costa; macrotrichia distributed on veins of  $R$ ,  $R_s$ ,  $M_1$ ,  $M_2$ ,  $M_{3+4}$ , and  $Cu_1$  distad of  $fMCu$ ; those of membrane spread on distal one-third of cell  $R_5$ , entire area of cell  $M_1$ , between  $M_2$  and  $M_{3+4}$ , cell  $M_3$ , entire area of cell  $M_4$ , and several trichia beneath vein  $Cu_1$ . Venation:  $R_1$  short, about half of  $R_s$ , ending at level of forking point between  $M_1$  and  $M_2$  or of  $fMCu$ ,  $Cu_1$  ending under middle of second radial cell,  $M_{3+4}$  ending little beyond tip of  $R_s$ ,  $R_s$  rather long, ending at 6.5 of wing measured from incision between squama and alula. Haltere white.

Abdomen with tergites brown to pale brown, sternites and lateral sides yellow; cerci yellow, elongate caudad, about three times as long as widest part, tapered, and ending in blunt tips. One spermatheca, large, yellowish brown, oval, with short chitinated duct; two subequal to each other, smaller, with other structures as in larger one.

*Male*: Body length about 1.3 mm. Wing about 0.73 mm. by 0.23 mm. General coloration and structure mainly as in female except for usual sexual differences.

Head brown; mouthparts yellow; eyes pubescent, barely contiguous above. Clypeus brown, with two pairs of setae. Maxillary palp with five segments in proportion of 4:6:7:7:8; segment 3 somewhat oval, with small sensory pore just beyond middle. Antenna with two basal segments, three distal segments, and plumose hairs brown and intermediate nine flagellar segments yellow; segments 2 to 10, 2 to 11, 11 to 14, and 12 to 14 in proportion of 80:89:75:65; proportion of distal eight segments about 7:7:7:8:9.5:20:22:23.

Thorax brown and with yellow marking in mounted specimen; scutellum yellow, with brown median spot and pair of median bristles. Legs with coloration as in female but faintly brownish at distal ends of fore and middle femora; rather distinct tarsal spurs present on middle leg, one on each distal end of basal three segments; proportion of leg segments, except for basal two, as follows: 75:78:30:15:9:7:11 in fore leg, 103:78:55:24:10:7:10 in middle leg, and 75:75:35:14:9:8:12 in hind leg.

Wing glassy hyaline, with very few macrotrichia on distal margin of cell  $R_5$ , tip of second radial cell brown. Venation: Second radial cell very narrow and slit-like,  $R_s$  ending at middle of wing and somewhat thickened at tip,  $fMCu$  under tip of  $R_{4+5}$ . Haltere yellowish white.

Abdomen yellow, with three, very obscure, brownish vittae on dorsal side of basal segments. Hypopygium brown, but style yellow; tergite 9 somewhat trapezoid, but caudal angles round and caudal margin very shallowly concave; sternite 9 transverse, very shallowly and broadly concave on caudal margin, and caudal membrane very sparsely spinulose; coxite short and somewhat triangular; style almost as long as coxite, curved just before middle, very gradually tapered on distal half and each ending in blunt tip; aedeagus broad, somewhat triangular, but distal margin broadly round and with small median blunt projection, basal arms small; parameres slender, just contiguous at mesal angles of basal parts and tapered distad, distal one-third curved ventrolaterad, basal roots rather slender.

Holotype, female (US 64044), Colonia, Ponape, hydroelectric plant, Aug. 9, 1946, Townes. Allotype, male (BISHOP 2597), Mt. Temwetemwensekir, Ponape, 180 m., light trap, Jan. 19, 1953, Gressitt.

DISTRIBUTION: Caroline Is. (Ponape).

This minute species is closely allied to *A. congolensis* de Meillon in the structure of the wings; but in *congolensis*, the general coloration is more brownish, the legs have dark knee spots, the abdomen is mainly dark brown, the eyes are intensely hairy, and there are two spermathecae, differing from this species.

109. *Alluaudomyia bipunctata* Tokunaga and Murachi, n. sp. (fig. 81).

Minute, brownish; thorax with yellow and brown markings, wing with two dark spots on anterior part, and legs mottled with yellow and brown markings. Eyes bare and scutum without dark dots at base of setae.

*Female*: Body about 1.5 mm. long. Wing about 0.8 mm. by 0.32 mm.

Head brown, with vertex dark brown and mouthparts pale brown. Eyes separated above as wide as half of facet. Maxillary palp with segments in proportion of 5:9:8.5:7.5:10. Clypeus with three pairs of lateral setae. Antenna with scape brown, other segments pale brown; AR about 1.23; distal seven segments in proportion of 10:11:15:15.5:17:18:19.

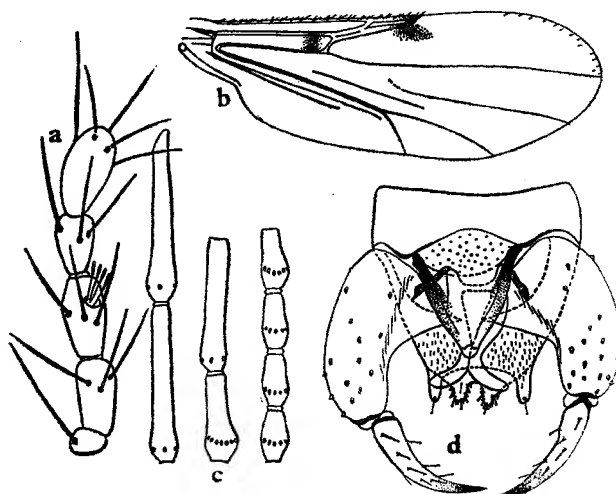


FIGURE 81.—*Alluaudomyia bipunctata*, male: a, maxillary palp; b, wing; c, distal eight antennal segments; d, hypopygium.

Thorax, in mounted specimen, pale brown in ground color; scutum brown along cephalic margin, yellow on middle part of anterior half, brown along transverse line at middle of scutum, broadly brown on central part of caudoscuteal area, with pair of elongate yellow markings along lateral sides of central brown pattern of caudoscuteal area, pair of slender brown lines on entire length of longitudinal foveae and obscure brown line along mid-dorsal line of anterior half of scutum. Scutellum brown, but yellow on lateral parts and with two pairs of distinct setae on brown area; postscutellum brown and obscurely yellowish along anterior margin. Legs mottled with yellow and brown markings; coxae brown, trochanters yellow on lateral half and brown on mesal half. In fore leg, femur brown and with basal and preapical yellow ring, knee joint brown, tibia brown and with sub-basal and obscure preapical yellow ring, tarsal segments yellow, but base of segment 1 brown. In middle leg, femur mainly yellow, with both ends brown, small brown cloud at basal one-third and a larger brown cloud at apical one-third, tarsal segment as in fore leg. In hind leg, femur broadly yellow on basal part, broadly brown on middle part, with distinct preapical yellow ring and tip brown, tibia yellow, with brown median ring and brown tip, tarsal segment 1 brown and other tarsal segments yellow. Longer claws as long as tarsal segment 5 on legs. Three basal tarsal segments of middle leg each with two distinct spurs, other legs without distinct tarsal spurs. Tarsal segment 4 of legs obcordate and 5 curved and somewhat clavate. Proportion of leg segments 23.5:22:8.5:



4.5:2.5:2.5:5.5 in fore leg, 30:28:13.5; 6:3:2.8:5 in middle leg, and 23:24:10:4.5:2.5:2.3:4.5 in hind leg.

Wing with two dark spots: One just before r-m, covering apical parts of R and M and membrane between these two veins, but not covering r-m; one at tip of second radial cell, covering tips of Rs and costa and membrane of cell  $R_5$  adjacent to tip of Rs, but not covering membrane of second radial cell. Veins  $M_1$ ,  $M_2$ ,  $M_{3+4}$ , and  $Cu_1$  very obscure and hyaline. Macrotrichia on radial veins, tip of  $M_1$ , and distal marginal areas of cells  $R_5$  and  $M_1$ . Venation:  $R_1$  ending at levels of forking points between  $M_1$  and  $M_2$  and tip of  $Cu_1$ , Rs ending just before tip of  $M_{3+4}$  and extended to seven-tenths of wing measured from auxillary incision, fMCu before forking point between  $M_1$  and  $M_2$ , Rs longer than twice of  $R_1$  and obliquely curved before tip. Haltere white.

Abdomen yellow, with brown tergal markings; tergite 2 with brown inverted V-shape and pair of linear lateral markings, tergite 3 brown, broad and bluntly produced caudad at middle, tergite 4 brown, broad and subsquare, 5 as 3, 6 produced caudad at lateral sides and middle part, 7 with paired lateral and median brown markings, 8 with paired small lateral brown markings. Cerci yellow. One spermatheca large, brown, sub-spherical, with short chitinized duct; one smaller and shaped as in larger one; one minute, tubular, and brown.

*Male*: Body about 1.11 mm. long varying from 1.04 mm. to 1.18 mm. Wing about 0.82 (0.79-0.87) mm. by 0.27 (0.27-0.29) mm. Coloration mainly pale brown and yellowish white, wing with two small dark clouds on costal area, legs mainly yellowish white and with many brown bands, hypopygium brown, with styles slender and sharply pointed and parameres somewhat spoon-like and connected by short basal bar.

Head mainly brown, with eyes bare and just touching above, proboscis about a quarter of length of head capsule, mouthparts yellowish white, clypeus with six or eight small setae. Maxillary palp stout, with segment 3 as long as 2 or a little shorter and sensory pore small and bearing long sensillae; five segments in proportion of 3.8:9.3:8.3:6.3:8. Antenna with scape brown, basal short segments and plumose hairs yellowish white, apical three long segments and apical two-thirds of segment 11 pale brown; combined relative length of segments 2 to 10 and 11 to 14 about 89:72.7 and those of segments 2 to 11 and 12 to 14 about 101:60; proportional length of distal eight segments about 7.3:7.7:7.3:8:12:17.7:20.7:20.7.

Thorax mainly brown and with yellowish-white spots; scutum with central rhombic brown spot, pair of pale brown vittae between brown foveae on anterior half, pair of yellowish-white spots on caudoscuteal area, lateral parts pale brown, scutellum and post-scutellum brown, but lateral margins yellowish, scutellum with two pairs of median bristles. Legs mainly yellowish white, with distinct brown bands on femora and tibiae, coxae yellowish brown, but fore coxae far paler, all trochanters pale brownish yellow, all femora with large median and small apical brown bands, fore tibia with small sub-basal, large median and small apical brown band, middle tibia with small sub-basal, preapical and apical brown bands, hind tibia with large median and small apical brown band, hind first tarsal segment entirely brown, one pair of tarsal spurs present on apical ends of two basal segments of middle leg and absent in other legs, claws simple; relative length of leg segments, except for basal two, about 88:79:34:19:9:8:13 in fore, 112.3:96.7:55.7:21.8:10:8.2:12.8 in middle, and 88.3:86.3:39.3:16.2:9.2:6.8:14.7 in hind leg.

Wing with small brown cloud before r-m between R and M, another small brown cloud near end of second radial cell covering distal ends of costa and Rs, very sparse macrotrichia arranged in line very closely along apical half of costal margin of cell  $R_5$ , very faint lineal clouds covering sub-basal parts of veins  $M_1$  and  $M_2$  and basal parts of  $M_{3+4}$  and  $Cu_1$ . Venation: Costa ending above or slightly beyond tip of  $Cu_1$  and at basal 0.57 of wing length (36.2:63), Rs about 1.7 times of  $R_1$  (12.7:7.3), second radial cell about 1.5 times as long as first, elongate and triangular, relative length of R, M, and stem of fMCu about 17.7:16.7:28, fMCu under middle of second radial cell,  $M_{3+4}$  not deflected from its stem and much longer than twice of  $Cu_1$  (18.3:7.8). Haltere entirely yellowish white.

Abdomen mainly yellowish pale brown, with brown marking on dorsal side, tergites 1 and 2 with T-shape band on each anterior half, 3 with V-shape spot on middle, 4 entirely brown, 5 extensively brown and with pair of small pale spots along caudal margin, 6 with triangular ill-defined spot, 7 almost entirely yellowish, 8 somewhat brownish on lateral sides; sternal side yellow. Hypopygium entirely brown; sternite 9 with caudal emargination wide and shallow, caudal membrane quite bare, tergite 9 tapered, with anal points cylindrical and round at apices; coxites suddenly narrowed and curved at middle, styles slender, sharply pointed, slightly arcuate and about 0.8 as long as coxites (21:26); aedeagus triangular, with basal arch very low, parameres longer than aedeagus (21:18), as long as styles, basal parts connected with each other by short sub-basal bar, basal two-thirds convergent caudad, then strongly curved laterad and slightly dilated, ending in round apices.

Holotype, female (US 64045), East Ngatpang, Babelthuap I., Palau Is., light trap, Dec. 10, 1952, Gressitt. Allotype, male (US), Ngaremlengui, Babelthuap I., Palau, June 1, 1957, light trap. Sabrosky. Paratypes, male, Gagil District, Yap, June 10, 1957, light trap, Sabrosky; male, same locality, June 16, 1957, Sabrosky.

DISTRIBUTION. Caroline Is. (Palau, Yap).

This species is closely allied to the African *A. albopicta* Ingram and Macfie, but there are no macrotrichia in cell  $M_2$ , and fMCu is located much before the level of the tip of  $R_1$ . The three new Micronesian species, *A. monopunctata*, *A. bipunctata*, and *A. insulicola*, are so closely allied that it may be difficult to separate them in the dry state, except for the markings of wings and legs.

#### 110. *Alluaudomyia insulana* Tokunaga and Murachi, n. sp. (fig. 82).

Small, brownish; wing with dark-brown spots on distal halves of M and R, on anastomosing part of  $R_1$  and  $R_s$ , and on distal end of second radial cell; scutum of thorax mainly brown and with pale-brown or yellow marking; scutellum mainly yellow and other parts of thorax brownish; legs mainly yellow and with somewhat variable brown marking.

*Female*: Body length about 1.17-2.2 mm. Wing about 0.87-1.0 mm. by 0.35-0.4 mm.

Head uniformly brown. Eyes bare, very narrowly separated above. Mouthparts pale brown, maxillary palp with segments in proportion of 4.5:7:8:6.3:9.5. Antenna with scape pale brown, other segments brown; AR 1.08-1.29; distal eight segments in proportion of 9.3:9.3:10.3:15:15:16:15.5:17.5.

Thorax mainly brown. Scutum with pale-brown clouds: Pair of oval or somewhat rhombic spots enveloping humeral pits (sometimes paired spots confluent), pair of oblong large spots along lateral margins of caudal two-thirds and two small oblong spots on caudoscuteal area. Scutellum with pair of small pale-brown spots and pair of approximated small setae on brown median spot; postscutellum brown. Legs with brown and yellowish pale-brown markings; coxae brown on dorsal side and yellowish on ventral side; trochanters yellowish brown; femora with basal two-thirds or three-fourths brown and apical one-third or one-fourth pale, but sometimes bases narrowly yellow and apical yellowish bands absent in fore and middle leg; knee joints not distinctly darker; fore tibia paler on basal one-fourth or one-third, but sometimes with additional, small, incomplete pale ring on preapical part; middle tibia mainly pale brown, with brownish cloud at basal and apical one-third and brown at distal tip, but sometimes mainly brown and with rather broad basal and narrow preapical pale ring (preapical ring very obscure or absent in darker specimen); hind tibia mainly pale brown, with brown cloud before middle and brown tip, but in darker specimen mainly brown and with pale basal and preapical rings as in middle tibiae; tarsal segments mainly pale brown, but base of middle basitarsus

somewhat brownish and entire hind basitarsus brown; claws unequal, longer one fully as long as tarsal segment 5 and twice of shorter one (18:17:9). Leg segments in proportion of 88:83:32:15.5:10.5:9.3:20 in fore leg, 116:105:55:24:11.5:11:20.5 in middle leg, and 95:92:43:16:11:9.5:16.5 in hind leg.

Wing with three dark spots on anterior margin and median and cubital veins rather broad and pale brown; basal dark spot enveloping distal halves of veins R and M, membrane between these parts of veins and adjacent membrane of costal cell, but not covering r-m, but, in paler specimen, this dark marking very obscure, practically absent, middle spot small, located at middle on fused part of  $R_1$  and  $R_s$  and not extending onto adjacent membranes and distal spot at end of  $R_s$ , and covering adjacent part of costal vein. Macrotrichia present on R,  $R_s$ , distal halves of  $M_1$  and  $M_2$ , at tip of  $M_{3+4}$ , and on membranes along distal marginal parts of cells  $R_s$ ,  $M_1$ , and  $M_2$ . Venation:  $R_1$  ending above forking

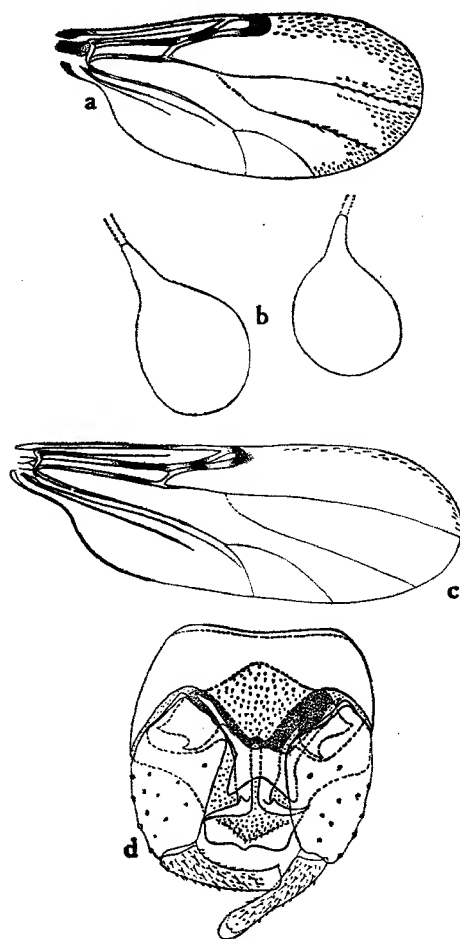


FIGURE 82.—*Alluaudomyia insulana*. a, b, female: a, wing; b, spermathecae. c, d, male: c, wing; d, hypopygium.

point between  $M_1$  and  $M_2$  and slightly before fMCu, Rs ending much before tip of  $M_{2+3}$ , relative length of Rs,  $R_1$ , and r-m about 17:9:10. Haltere pale yellow or white.

Abdomen yellow in ground color; tergite 3 with three, small brown clouds, 3 to 5 with these three clouds confluent along cephalic margin of each tergite, tergite 6 and 7 without brown markings, tergite 8 to 10 brown on cephalic halves; cerci white; two spermathecae unequal, somewhat pyriform, with distinct, rather long chitinized duct.

*Male:* Body 1.1-1.17 mm. long. Wing 0.73 mm. by 0.28 mm.

Head brown, with eyes bare and very narrowly separated above by less than one facet. Clypeus with two, and sometimes three, pairs of setae. Maxillary palp with five segments in proportion of 4:7:7:6.5:8. Antenna with scape, pedicel, and distal three segments brown and intermediate short flagellar segments and plumose hairs yellow; ultimate segment without terminal stylet; distal seven segments in proportion of 6:5.8:6.5:9:19.5:20:20.8; segments 2 to 10, 2 to 11, 11 to 14, and 12 to 14 in proportion of 73:82:67.5:58.

Thorax brown but scutum with yellow marking as in mounted female specimen, but anterior median pair of yellow spots always confluent and sometimes pair of small round spots present at humeral angles; scutellum yellowish and with pair of median setae; post-scutellum and pleural and sternal sclerites almost uniformly brown. Legs yellow and brown; coxae and trochanters as in female; in darker specimen, fore femur mainly brown except for yellowish basal end, fore tibia mainly brown and with basal and preapical yellowish band, middle tibia mainly brown and with yellowish basal band on quarter, hind femur and tibia similar to middle leg, hind basitarsus entirely brown; in paler specimen, all femora broadly brownish on middle parts, narrowly yellowish at bases, and yellowish on apical quarter, fore tibia brownish on middle part and broadly yellowish on both ends, middle and hind tibiae mainly yellow and narrowly brown only at tips, hind basitarsus entirely brown; in an intermediate form, middle tibia with two brownish middle rings beside brown apical ring and hind tibia with brownish middle ring; coxae brown on dorsal and yellow on ventral side, trochanters brown on ventral and yellow on dorsal side, tarsal segments, except for brown hind basitarsus, mainly yellow, but 4 somewhat faintly brownish. Claws small and equal. Tarsal apical spurs only in middle leg, one on each of three basal tarsal segments. Proportion of leg segments, except coxae and trochanters, about 100:73:30:15:10:8:11 in fore leg, 113:88:52:19:11:8:11 in middle leg, and 80:75:34:15:9:7:12 in hind leg.

Wing with macrotrichia very sparse, in line close along fringe of cell  $R_2$ , typically with dark spot at distal margin of second radial cell, small dark spot on distal part of anastomosing vein of  $R_1$  and Rs and brownish cloud covering distal parts of R and M; in paler specimens, basal brownish cloud absent and dark spot on anastomosing vein obscure. Venation: Rs ending just beyond middle of wing (30:58), fMCu under tip of Rs, base of  $M_2$  atrophied. Haltere yellowish white.

Abdomen mainly yellow, but tergites of segments 2 and 5 pale brown, with pair of yellowish spots. Hypopygium brownish dark; tergite 9 broad on basal half and suddenly narrowed somewhat trapezoid on caudal half, its caudolateral corners bluntly round, its caudal margin very shallowly concave and with minute conical projection at middle; sternite 9 somewhat trapezoid, broadened caudad, and its caudal margin concave in V-shape; coxite rather shorter, tapered, and with lateral side evenly convex; style yellowish white, almost straight, slightly shorter than coxite, not tapered, somewhat truncate at distal end, and ending in small blunt tip. Aedeagus with large medial sclerite on caudal part, with pair of large, blunt or pointed, triangular caudal projections at caudolateral parts, basal arms slender, long and divergent cephalad; parameres rather broad, extending caudad in parallel position and gradually narrowed beyond aedeagus, then curved ventrolaterad and ending in sharp point, basal roots of parameres divergent cephalad and each ending in very large knob within base of coxite.

Holotype, female (US 64046), Wena I., Truk, July 31, 1946, Townes. Allotype, male (BISHOP 2759), Mt. Unibot, Ton I., Truk, 32 m., light trap,

Jan. 1, 1953, Gressitt. Paratypes, Kusaie: Female, three males, Mwot, light trap, Apr. 10, 1953, Clarke; three females, three males (BISHOP), Mutunlik, light trap, Jan. 24, 1953, Gressitt; three males (US), Mutunlik, light trap, Mar. 30, 1953, Clarke.

DISTRIBUTION: Caroline Is. (Truk, Kusaie).

This species is somewhat related to the African *A. albopicta* Ingram and Macfie and *A. imparunguis* Kieffer. However, the thoracic markings, the shape of spermathecae and the male hypopygium of this species are quite specific, differing from all other known species of the genus.

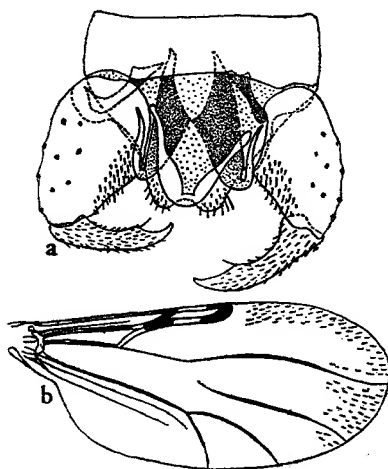


FIGURE 83.—*Alluaudomyia insulicola*: a, hypopygium, male; b, wing, female.

111. *Alluaudomyia insulicola* Tokunaga and Murachi, n. sp. (fig. 83).

Small, yellowish-brown to brown; scutum not shining and without dark dots at bases of setae; coloration of thorax, abdomen, wings, and legs different sexually; female more brownish than male. In male, legs almost entirely very pale brownish yellow, with tibial distal ends of fore and hind legs and first hind tarsal segments brown; in female, fore legs with distinct yellow and brown markings.

*Male*: Body about 2 mm. long. Wing about 0.9 mm. by 0.41 mm.

Head pale brown, with vertex brown and mouthparts pale brown. Eyes separated above as wide as half of facet. Clypeus with pair of long setae above and pair of short setae below. Maxillary palp with segments in proportion of 5:8:9.5:7:10. Antenna, in dry state, brown and with dark-brown plumose hairs, but, in mounted specimen, scape yellow, short basal segments pale brown and long distal segments and plumose hairs brown. Segments 2 to 8, 2 to 9, 2 to 10, 2 to 11, 9 to 14, 10 to 14, 11 to 14, and 12 to 14 in proportion of 60.5:68.5:77:89:118.5:110.5:102:90; distal eight segments in proportion of 7.5:7:7.5:8:12:26:29:29.

Thorax, in dry state, yellowish brown and mat, scutellum brown and with brown setae and, in mounted specimen, generally very pale brown. Scutum with slightly brownish clouds: Pair of longitudinal ones arising from humeral pits, extending along lateral sides of foveae, then expanding laterocaudad, and ending far before scutellum; oblong median

cloud along mid-dorsal part; and small, triangular median cloud on caudoscuteal area; scutellum very pale brown; postscutellum more brownish; scutellum with pair of small, closely approximated setae. Legs almost entirely pale brownish yellow, but tibial distal ends of fore and hind legs and first hind tarsal segment brown; in fore leg, basal three segments each with distinct tarsal apical spur; in middle leg, these segments each with two, and in hind leg, no distinct spurs; claws simple and equal. Leg segments in proportion of 99:90:36:19:12:10:16.5 in fore leg, 125:111:60:30:14:8:15 in middle leg, and 104:101:45:17:13:9:16 in hind leg.

Wing white, with radial veins yellowish and median and cubital veins rather broad and pale brown, with two dark spots on anterior part, basal one before r-m and enveloping distal one-third of R and M, adjacent membranes between these two veins and costal cell, but not extending on to r-m and costal vein, apical dark spot enveloping distal one-third of Rs and costal vein of second radial cell and adjacent membrane of cell  $R_5$ , but not extending onto second radial cell. Venation:  $R_1$  rather long, longer than half of Rs and ending above forking point between  $M_1$  and  $M_2$ , Rs ending slightly beyond fMCu and extending to 5.6 of wing measured from axillary incision, second radial cell triangular in shape,  $M_{1+2}$  subequal to  $R_1$  and much shorter than Rs (8:7:12). Macrotrichia very scanty on membrane, in line closely along distal margins of cells  $R_5$  and  $M_1$ . Haltere pale brown to yellow.

Abdomen brown in dry state and very pale yellowish brown in mounted specimen and with pair of lateral and small, pale-brown median clouds on tergites of segments 2 to 6. Hypopygium with sternite 9 short, very broad, and almost straight on caudal margin; coxite longer than basal width, coniform and widely separated at base; style rather small, slender, tapered, with pointed tip slightly curved and preapical small erection on flexor side, on which small seta is found at tip. Aedeagus bluntly round at tip, membranous, but with marginal chitinized plate slender at basal parts and slightly expanded on caudal parts; parameres large, triangular, basal angles pointed and extended cephalad, median mesal angles obtuse and opposite and apical angles extended to very slender filamentous projections which curve sharply cephalad, basal apodemes slender, originating within bases of coxites and gradually narrowed, extending straight to basal angles of parameres, and ending slightly thickened at tip.

*Female:* Body length about 1.05 mm. Wing about 0.82 mm. by 0.34 mm.

Head brown; eyes almost contiguous above and with minute pubescence. Clypeus with two pairs of small setae. Maxillary palp brown, with five segments in proportion of 4:9:8.5:7:10; segment 3 somewhat oblong and with small sensory pore beyond middle. Antenna brown, with AR about 1.44; distal ten segments in proportion of 7:8:9.5:9.5:11:15:18:18.5:20:25.

Thorax almost entirely yellow, with three, yellowish pale-brown vittae on scutum in mounted specimen; scutellum with pale-brown median spot and pair of median bristles. Legs mainly yellowish pale brown, with pale-brown marking, fore and middle femora brownish on basal half of basal two-thirds, fore tibia with brownish band before, or at, middle part and at distal end, hind tibia brownish at distal end, hind basitarsus more brownish; claws strongly unequal, longer one as long as tarsal segment 5 and far longer than shorter claws (18-20:14-15); proportion of leg segments, except for coxae and trochanters, about 95:92:36:18:10:10:20 in fore leg, 125:116:62:27:11.5:8:19 in middle leg, and 90:92:35:14:10:10:18 in hind leg.

Wing with two dark-brown spots, one covering middle half of R and distal half of M, and one covering tip of Rs, adjacent costa, and membrane; veins pale brown; macrotrichia sparsely arranged on costal marginal area of cell  $R_5$ , distal part of cell  $M_1$ , and along distal margin of cell  $M_2$ . Venation: Rs ending much beyond middle of wing (30:64) and at level of midway of margin of wing between tips of  $M_{2+3}$  and  $Cu_1$ , forking point of  $M_{1+2}$  and fMCu at same level and just beyond middle of Rs. Haltere white.

Abdomen mainly yellow, with pale-brownish markings on tergites of segments 2 to 6 and tergite 8 almost uniformly brown in mounted specimen. Two spermathecae slightly unequal, brown, round, with short chitinized neck part.

Holotype, male (US 64047), Mt. Temwetemwensekir, Ponape, Caroline Is. 180 m., Jan. 19, 1953, Gressitt. Allotype, female (BISHOP 2598), south-east Nanpohnmal, Ponape, Caroline Is. 70 m., light trap, Jan. 12, 1953, Gressitt.

DISTRIBUTION: Caroline Is. (Ponape).

This species is somewhat related to *A. aterivena* Tokunaga from Kyushu, Japan, but, in *A. aterivena*, the female wings are more hairy, with macrotrichia in cell  $M_4$  and anal cell, the female AR is smaller (0.78), and the legs of both sexes have quite different markings.

#### Genus *Stilobezzia* Kieffer (1911)

*Hartomyia* Malloch (1915), *Eukraiohelea* Ingram and Macfie (1921), and *Neostilobezzia* Goetghebuer and Lenz (1934).

Body rather slender and rather sparsely setigerous. Eyes bare. Female antenna with segments 2 to 9 oval or short cylindrical and segments 10 to 14 long and cylindrical. Male antenna with well-developed plumose hairs on segments 2 to 11 which are short, oval or short cylindrical, segments 12 to 14 long and cylindrical. Ultimate antennal segment of each sex longest, pointed at tip, and ending in apical seta. Mesoscutum usually with small humeral pits and few short bristles; scutellum with various numbers of strong bristles and sometimes with small accessory setae. Legs slender; femora without spines; tarsal segment 4 of legs cordiform; segment 5 elongate and somewhat clavate; tarsal segment 1 of middle legs with sub-basal spur; female claws single, large, and unequally bifid on legs; male claws normal, small, and equal; empodium absent. Wing rather long, with microtrichia on membrane, usually with macrotrichia toward tip. Venation: Costa extending more than basal two-thirds of wing, two radial cells present and distinct, but rarely first radial cell reduced in various degrees, intercalary fork distinct, cross vein r-m more or less oblique, median fork with rather long petiole,  $M_2$  usually not reduced at base, anal vein straight and not interrupted at middle. Male hypopygium with coxite and style simple; sternite 9 very short and transverse; tergite 9 usually rounded caudad and with setigerous paired caudal lobes at caudal end; aedeagus reduced to pair of oblique lateral sclerites; parameres consisting of large and greatly modified submedian processes, apodemes of parameres highly modified. Female spermathecae usually two large and one small.

#### KEY TO MICRONESIAN SPECIES OF *STILOBEZZIA*

1. Wing with three dark costal markings and highly reduced first radial cell ..... 112. *esakiana*  
     Wing without colored markings and with normally developed first radial cell ..... 2
- 2(1). At least hind femur mainly dark brown, deep brown, or brown ..... 3  
     Femora and tibiae mainly yellow, pale brown, or yellowish pale brown ..... 7
- 3(2). All femora brown and all tibiae brownish basally and yellowish pale brown apically ..... 113. *pallidicornis*  
     Hind femur and tibia mainly dark brown or deep brown ..... 4
- 4(3). Female tarsal segment 5 of middle leg with two strong spurs on sub-basal part; male aedeagal sclerites slender, not angulate ..... 114. *esakii*  
     Female tarsal segment 5 without strong spines or spurs; male aedeagal sclerites strongly curved, with rather broad lateral expansion at shoulder part ..... 5

- 5(4). Thoracic tergites entirely dark brown or deep brown.....115. *albiabdominalis*  
 Thoracic tergites pale brown, yellowish pale brown, or brownish yellow.... 6
- 6(5). Thoracic scutellum with only five strong bristles and without small accessory setae; male parameres slender and claw-like.....116. *spadicitibialis*  
 Thoracic scutellum with eight strong bristles and usually with several small accessory setae; male parameres stout and apically forming round lamella.....117. *gressitti*
- 7(2). Thoracic scutum with four or three brown vittae on yellow, pale-brown, or yellowish pale-brown ground color; legs yellowish pale brown and knee joints conspicuously dark brown.....118. *fuscigenua*  
 Thoracic scutum otherwise; legs without conspicuous markings on knee joints ..... 8
- 8(7). Thoracic scutellum darker than anterior half of scutum and postscutellum; posterior half of scutum with pair of darker vittae along lateral sides.....119. *fusciscutellata*  
 Thoracic tergites concolorously yellow, pale brown, pale yellowish brown, yellowish pale brown, or brown mainly; sometimes scutellum paler than scutum and postscutellum..... 9
- 9(8). Fore tibial spur differing from hind tibial spur, strong, long, curved, darker or more brownish than hind tibial spur.....*calcaris* group  
 Fore tibial spur like hind tibial spur, short, almost straight, yellow, pale brown or yellowish brown..... 10
- 10(9). Thoracic scutellum with eight or more setae including small accessory setae ..... 11  
 Thoracic scutellum with less than eight setae, including small accessory setae ..... 13
- 11(10). Thoracic scutellum with only four strong bristles.....126. *longistyla*  
 Thoracic scutellum with more than four strong bristles..... 12
- 12(11). Male style of hypopygium somewhat spindle-shape; female scutellum with four to six small accessory setae and at most six strong bristles.....127. *fusistylata*  
 Male style of hypopygium somewhat sickle-like; female scutellum without or with two small accessory setae and eight strong bristles.....128. *setigeriscutellata*
- 13(10). Fore coxa distinctly brownish or darker, differing from other paler coxae; flagellum of antenna bicolored; basal short segments pale yellow and distal long segments brownish.....129. *spadicicoxalis*  
 Fore coxa not distinctly different in color from other coxae; flagellum of antenna almost uniformly brownish..... 14
- 14(13). Smaller species; wing less than 1.3 mm. long; parameres of male hypopygium yellowish.....130. *subsoror*  
 Larger species; wing larger than 1.3 mm. long; parameres of male hypopygium brownish.....131. *fulviscuta*

# 112. *Stilobezzia* (*Eukraiohelea*) *esakiana* Tokunaga.

*Stilobezzia esakiana* Tokunaga, 1940, *Tenthredo* 3 (2): 183 (Ponape).—

Johannsen, 1946, B. P. Bishop Mus., Bull. 189: 190 (Guam).

*Stilobezzia* (*Eukraiohelea*) *esakiana*, Wirth, 1953, U. S. Nat. Mus., Proc. 103 (3316): 61.

Large dark-brown or black, with gray pruinose pattern on scutum and many dark dots at bases of scutal setae; wing with brown spots along costal margin and at ends of



veins and first radial cell very small or practically absent; legs pale brown and with dark-brown or brown rings.

*Female*: Body length about 4.13 mm. Wing about 2.23 mm. by 0.77 mm.

Head dark brown, with eyes just separated above; clypeus with four pairs of lateral setae. Maxillary palp with segments in proportion of 10:22:30:16:30; segment 3 elongate, with group of spoon-like sensillae in shallow depression beyond middle. Antenna yellow to brown, mottled, with scape yellowish brown, segment 2 yellow on basal one-third and brown on apical two-thirds, segments 3 to 4 entirely brown, segments 5 to 9 yellow on basal three-fourths and brown on distal one-fourth, segments 10 to 14 entirely brown; basal short flagellar segments at least twice longer than basal width; AR about 1.51; distal eight segments in proportion of 7.5:8:8:15:16.5:16:16.5:24.5.

Thorax dark brown, with irregular brownish-gray pruinose pattern in dry specimen as follows: Pair of oval spots at shoulder angles; linear median vitta on anterior two-thirds of scutum; pair of short vittae on middle half of scutum along foveae; large triangular spot on anterior half of scutum which contains two dark, round spots; pair of subrhombic spots on caudoscuteal area, each containing a dark and a small round spot; scutellum with oval spot containing pair of small dark dots; postscutellum pruinose on basal half; pleural sides with very irregular gray pattern; scutal setae with dark dots at bases; scutellum with two median bristles and pair of long lateral bristles and pair of smaller accessory setae mesad of lateral pair. Legs with coxae and trochanters dark brown, femora and tibiae mainly yellowish brown and with brown or dark-brown rings: Femora with sub-basal and preapical ring, tibiae with sub-basal and apical ring, fore coxae darker than in other legs, fore knee joints dark; middle femora dark apically, tarsi mainly yellowish pale brown, but apical two segments more brownish than other segments; fore femora without ventral spines differing from the other species of the subgenus *Eukraiohelea*; hind tibia with row of strong bristles on extensor side. Tarsal segment 1 with spur or spine on both ends; in fore and middle leg segment 1 with two additional ones on middle part, 2 with apical one, 5 without distinct spurs. Claws long, slender, almost as long as segment 5, each with small basal claw shorter than half of long claw (15:40); proportion of leg segments, except for coxae and trochanters, 55:57:38:17:5:4.5:9 in fore leg, 66:63.5:43:16:6:5.5:10 in middle leg, and 65:70:38:18:7:5.5:12 in hind leg.

Wing with veins yellow, seven dark-brown spots along margin as follows: One along r-m, first radial cell, and  $R_1$ ; one at tip of  $R_s$  and only slightly extending caudad from  $R_s$ ; one at middle between tips of  $R_s$  and  $M_1$ ; one on each tip of  $M_1$ ,  $M_2$ ,  $M_{2+3}$ , and  $Cu_1$ . Macrotrichia of membrane absent. Venation: First radial cell absent or minute, when present somewhat square,  $R_1$  as long as r-m,  $R_s$  slightly swollen apically, ending above or just beyond tip of  $M_{2+3}$ ,  $M_{1+2}$  about half of r-m, fMCu before r-m, r-m almost perpendicular and above tip of  $Cu_1$ . Haltere yellow and with brown spot on knob.

Abdomen mainly yellow, sternites with paired pale-brown patches, tergites brownish yellow, lateral sides slightly dusky; cerci yellow; three spermathecae brown, one large and oval, one slightly smaller and round, one vestigial and discoidal, chitinized ducts absent.

*Male*: Body length about 3.4 mm. Coloration and structure closely similar to female with usual sexual differences. Proportion of distal six antennal segments about 28:32:47:63:87:137. Hind tarsal segments in proportion of 25:13:5:3:6; middle tarsal segment 1 without middle spurs. Proportion of  $R_1$ , r-m, and  $M_{1+2}$  about 30:30:20. Haltere with knob brown on dorsal side and dark on ventral side. Hypopygium yellow, tergite 9 longer than basal width, subtriangular, round at caudal tip; coxite long and conical; style slender, only very slightly arcuate, as long as coxite, and ending in sharply pointed tip; aedeagus with basal arch very low, evenly arcuate slightly, each basal arm slender and its root very slender, apical projection very small and sharply pointed; parameres long, almost as long as coxite, basal two-thirds rather broad and two sides of each paramere parallel, then abruptly narrowed, apical one-third very slender, ending in round tip curving ventrad; apodemes somewhat sagittate, each apex connected with base of paramere and stem laterally extending undulately and ending at lateroproximal corner of coxite.

DISTRIBUTION: Mariana Is., Caroline Is.

S. MARIANA IS. GUAM: Three females, May-June 1945, G. Bohart and Gressitt.

PALAU. BABELTHUAP: Ngerhelong Pen., eight females, 14 males, light trap, May 1957, Sabrosky; Ulimang, female, Dec. 1947, Dybas; Ngiwal, female, Aug. 1951, Gressitt; five females, four males, May 1957, Sabrosky; Ngaremlengui, eight females, nine males, light trap, May, June 1957, Sabrosky; Melekeiok, female, four males, May 1957, Sabrosky. KOROR: Female, two males, light trap, Dec. 1952, Gressitt; male, light trap, Apr. 1953, Beardsley; four males, June 1957, Sabrosky.

YAP. YAP: Hill behind Yaptown, 50 m., one, light trap, Dec. 1952, Gressitt. GAGIL-TOMIL: Gagil Distr., two females, male, light trap, June 1957, Sabrosky.

PONAPE. Agric. Exper. Sta., Colonia, female, light trap, Jan. 1953, Gressitt.

This species belongs to the subgenus *Eukraiohelea* Ingram and Macfie [Wirth, 1953, Proc. U. S. Nat. Mus. 103 (3316): 61] on the basis of the first radial cell being highly atrophied and the cross vein r-m forming a straight perpendicular line with R<sub>1</sub>. However, the fore femora have no ventral spines, differing from the other species of this subgenus.

### 113. *Stilobezzia pallidicornis* Tokunaga and Murachi, n. sp.

Rather large, brownish. In male, short basal flagellar segments and plumose hairs very slightly brown and almost hyaline; scutum pale brown and brown only on lateral area, scutellum brown and with five median bristles and two lateral ones, postscutellum pale brown; legs with coxae, trochanters, and basal parts of tibiae brown to pale brown, other distal parts and tarsi all yellowish pale brown; wing with very sparse macrotrichia along distal margins of cells R<sub>s</sub> and M<sub>1</sub>; coxite of hypopygium swollen basally and aedeagal sclerites rather slender.

*Male*: Body about 2.44 mm. long. Wing about 1.51 mm. by 0.43 mm.

Head with vertex and frons brown, mouthparts yellowish pale brown, eyes narrowly separated above. Maxillary palp with five segments in proportion of 8:17:25:10:25. Antenna with scape brown, short basal flagellar segments and plumose hairs almost hyaline and very slightly brownish, segment 11 with apical margin brownish, distal segments 12 to 14 brownish; distal eight segments in proportion of 17:16.5:16:16:19:47:70:130; segments 2 to 10, 2 to 11, 11 to 14, and 12 to 14 in proportion of 168:188:270:250.

Thorax brown on lateral parts of scutum and pale brown on median part; lateral brown areas somewhat triangular, median paler area subdivided into lunate anterior part and semicircular posterior part, in anterior part with two small, oval, much paler spots and posterior part with three yellowish, pale-brown obscure spots. Scutellum brownish, with five median bristles and two lateral bristles and without small accessory setae; postscutellum pale brown; pleural and sternal sclerites pale brown or brown. Legs with coxae brown and trochanters, femora, and basal parts of tibiae brown to pale brown; fore tibiae pale brown on basal one-fourth and middle and hind tibiae pale brown on basal half; distal parts of all tibiae and all tarsi yellowish pale brown; leg segments, except basal two, in proportion of 179:171:107:58:20:15:25 in fore leg, 212:197:129:59:23:15:20 in middle leg, and 205:208:120:62:?:?:? in hind leg.

Wing almost hyaline, with veins yellowish pale brown, macrotrichia sparsely arranged along distal margins of cells R<sub>s</sub> and M<sub>1</sub>. Venation: Costa long, far beyond basal

two-thirds of wing (91.5:114),  $R_s$  about two-thirds of  $R$  (34:47) and four times as long as  $R_1$  (34:9), tip of  $R_s$  just beyond level of tip of  $M_{3+4}$ , tip of  $R_1$  just before tip of  $Cu_1$ , first radial cell small, second about three times as long as first (24:8.5), stem of  $fMCu$  much longer than  $R$  (52:47),  $fMCu$  under origin of  $r-m$ . Haltere pale yellow.

Abdomen with tergites almost entirely pale brown, sternites and lateral membranes yellowish pale brown, but hypopygium brown. Hypopygium closely similar to that of *S. albiabdominalis*, except for coxite and aedeagal sclerites; coxite swollen ventromesad at bases and not longer than twice of basal width (57.5:34); style much shorter than coxite (44:57.5); median lobes of paramere as long as style (44:44); aedeagal plates rather slender, each shoulder part not strongly expanded, basal half slender and slightly curved, apical pointed part short and about one-fifth of entire length.

*Female*: Unknown.

Holotype, male (US 64048), East Ngatpang, Babelthuap I., Palau Is., light trap, Dec. 10, 1952, Gressitt.

DISTRIBUTION: Caroline Is. (Palau).

This species is related to *S. albiabdominalis* and *S. gressitti* which are, however, distinctly different in the following points: In *albiabdominalis*, the abdomen is white, the scutellum has accessory setae, and the aedeagal sclerites have more prominent shoulder expansions and longer apical points; in *gressitti*, the coxites of the male hypopygium are not basally swollen, the scutellum has accessory setae, the hind femur is distinctly more brownish than in other legs, and the bases of parameres are much longer. The species is named in relation to the pale antennae.

#### 114. *Stilobezzia esakii* (fig. 84, a).

*Stilobezzia esakii* Tokunaga, 1940, *Tenthredo* 3 (2): 183 (Ponape).

Dark brown, strongly shining, and rather large; three legs different in coloration; in fore leg, femur yellowish pale brown and tibia white; in middle leg, femur brown and tibia white; in hind leg, femur and tibia dark brown; abdomen dark brown and with large white spot on dorsal side of segment 1.

*Male*: Body length about 2.36 mm. Wing about 1.78 mm. by 0.5 mm.

Head brown including mouthparts; eyes just contiguous above; clypeus with four pairs of lateral setae. Maxillary palp with segments in proportion of 6:12:21:14:21, last segment as long as 3. Antenna with scape orange brown, other segments and plumose hairs brown; segments 2 to 9, 2 to 10, 2 to 11, 10 to 14, 11 to 14, and 12 to 14 in proportion of 158:177.8:204.6:299.1:279.3:252.5; seven distal flagellar segments in proportion of 17.5:18.5:20.5:24:65:78:129.

Thorax entirely dark brown, strongly shining; scutellum with pair of rather small lateral setae and two long median setae. Legs with coxae brown and tarsi white; in fore leg, trochanter, femur, and both ends of tibia yellowish pale brown, tibia largely white; in middle leg, trochanter, basal one-fourth of femur and both ends of tibia yellowish pale brown, apical three-fourths of femur brown, tibia largely white; in hind leg, trochanter, apical three-fourths of both femur and tibia dark brown, basal one-fourth of both femur and tibia yellowish brown; tarsal spurs present only on basal two segments of middle leg and absent or indistinct on other legs; in middle leg, segment 1 with one sub-basal and two apical spurs and 2 with two apical spurs; claws equal, bifid at tip; leg segments, except for basal two, in proportion of 41:38.5:21.5:9.5:3.5:2.5:5 in fore leg, 54:49:33:11:3.5:2.5:4.3 in middle leg, and 50:48.5:24:10.5:3.3:2.2:5.3 in hind leg.

Wing hyaline, with anterior veins pale brown; macrotrichia absent on membrane and veins. Venation: First radial cell very small, only slightly longer than  $r-m$ ,  $R_1$  ending

before tip of  $M_{3+4}$ , first radial cell about one-seventh length of second (14:99),  $M_{1+2}$  much longer than first radial cell. Haltere dark brown.

Abdomen dark brown including hypopygium, base of dorsal side with large subcordiform white spot. Hypopygium with tergite 9 subtriangular, shorter than basal width and round at caudal end; sternite 9 transverse, with triangular median convexity between bases of aedeagus on caudal margin, without broad membrane; coxite expanded mesad at base, abruptly narrowed distad, and apical half or more slender; style slender, tapered, slightly arcuate on distal two-thirds, and pointed at tip; aedeagus with very slender and triangular basal arch, caudal projection slender and slightly clavate; parameres slender, as long as coxite, arising from lateroproximal corners of coxites, slightly undulate, extending caudomesad and convergent, both sides parallel, and ending in pointed tips; apodemes rather broad, curved caudomesad, gradually tapered, and with tips not pointed.

*Female*: Body length about 2.2-2.76 mm. Wing about 1.82 mm. by 0.63 mm. Coloration and structure generally as in male with usual sexual differences, but somewhat paler than male.

Head pale brown or yellowish brown; eyes separated above as wide as half a facet; mouthparts brown, maxillary palp with segments in proportion of 6:20:30:18:28.5. Antenna with scape yellow, segments 2 to 9 white, apical five segments brown or pale brown; AR 1.64-1.79; apical eight segments in proportion of 25:27:30.5:63.5:65.5:67.5:71.5:119.

Legs slightly variable in color, but fore femur always yellow or yellowish brown, fore and middle tibiae and all three basal tarsal segments mainly white, middle and hind femora and hind tibia mainly brown, dark brown, or black. Claws unequal, longer one about twice as long as shorter one; in fore leg, segment 5 with pair of sub-basal ventral tarsal spurs; in middle leg, segment 1 with sub-basal and two apical spurs; other segments of other legs without distinct spurs; leg segments, except basal two, in proportion of 49:43:25:11:4:3.5:10 in fore leg, 63:59:35:13:4:3.5:11 in middle leg, and 59:56:29:12:4:3.5:9 in hind leg.

Wing without macrotrichia as in male. Venation:  $R_1$  ending just before level of fMCu,  $R_s$  ending above tip of  $M_{3+4}$ , first radial cell small, shorter than one-fifth of second cell (24:128), much shorter than  $M_{1+2}$  but longer than r-m.

Abdomen dark brown and shining as in male, abdominal tergite 1 with large white spot; cerci brown; only one spermatheca, oval, brown but neck part yellow, with short yellow duct.

DISTRIBUTION: Caroline Is.

Allotype, male (US), Ulimang, Babelthuap I., Palau Is., Dec. 1947, Dybas.

PALAU. BABELTHUAP: Twelve females, seven males (US, CM), same data as for allotype; Ngaremlengui, female, light trap, June 1957, Sabrosky. KOROR: Two females (BISHOP), Feb. 1954, Beardsley. ANGAUR: Two males, May 1954, Beardsley.

#### 115. *Stilobezzia albiabdominalis* Tokunaga and Murachi, n. sp. (fig. 84, b, c).

Dark-brown or black; thorax entirely dark; male abdomen mainly white, except brown hypopygium; female abdomen dark in dorsal aspect and pale brownish yellow in ventral aspect. Legs with femora and tibiae mainly dark brown. Scutellum with at least three pairs of strong bristles and several small accessory setae.

*Male*: Body about 2.54 mm. long. Wing 1.54 mm. by 0.45 mm.

Head brown or yellowish dark, with mouthparts pale brown or yellow, eyes separated above hardly as wide as a facet. Antenna with scape orange brown or yellowish brown, plumose hairs and segments 2 to 11 pale brown or yellowish pale brown, segments 12 to 14 brown; ultimate segment very long and longer than twice of penultimate, which

is slightly shorter than twice of preceding one; distal seven segments in proportion of 12:12.5:13:15:38:60:125; segments 2 to 9, 2 to 10, 2 to 11, 10 to 14, 11 to 14, and 12 to 14 in proportion of 123:135.7:149.7:267.7:252.9:238.8. Clypeus brown and with seven to eight setae; maxillary palpal segments in proportion of 7:10:17:10:18.

Thorax black or dark brown, shining; scutellum with six or seven strong bristles and two to seven (five average) small accessory setae. Legs with coxae, femora and tibiae mainly dark brown, both ends of tibiae narrowly pale brown, trochanters pale brown, and tarsal segments mainly pale yellowish brown; in fore leg, segment 1 with apical tarsal spur and following two segments each with two apical spurs; in middle leg, basal three segments each with two apical spurs and 1 with additional sub-basal spur; hind leg similar to fore; tarsal segment 5 without distinct spurs; hind tibia armed with several strong bristles on dorsal side; claws symmetrical and bifid at tip. Proportion of leg segments, except for coxae and trochanters, about 40:38:24:11:4.5:3.8:8 in fore leg, 49:41:29:12:4.5:4:8 in middle leg, and 48:47.5:27:13:5:4:9.5 in hind leg.

Wing with veins dark brown, membrane brownish; macrotrichia almost absent on veins and very sparsely arranged along distal margin of cell  $R_s$ . Venation: Second radial cell long, about three times first cell (81:28), fMCu under end of r-m, tip of  $Cu_1$  at level of fM $_{1+2}$  and middle point of first radial cell,  $R_s$  ending slightly beyond tip of M $_{3+4}$ . Haltere pale brown in dry specimens and almost white in mounted specimens.

Abdomen almost entirely white, except for brown hypopygium and with brown setae. Hypopygium closely resembling that of *S. setigeriscutellata*; coxite large, longer than parameres, without distinct basal swelling; style evenly and slightly curved, entirely pubescent, not distinctly narrowed distally, each with small apical tubercle. Aedeagus with pair of curved lateral sclerites, which are sharply pointed at tip and laterally expanded, each forming flat lobe; parameres yellow, rather slender, somewhat racket-shape, each with apical circular hyaline lamella; basal apodemes of parameres rather small and somewhat rhombic.

*Female*: Body length about 2.27 mm. Wing about 1.66 mm. by 0.57 mm. General coloration similar to that of male, except for brown or dark-brown abdomen.

Head mainly dark brown, with eyes very narrowly separated above. Antenna with scape yellowish brown, segments 2 to 9 yellow and each with very narrow brown ring at distal tip, segments 10 to 14 brown, but their basal ends yellowish; AR about 1.8-1.9; distal eight segments in proportion of 19:22:23:52:52:58:61:89.

Thorax entirely black or dark brown and shining; scutellum with six to eight strong bristles and several (2-9) small accessory setae. Legs distinctly bicolored, coxae, femora, and tibiae mainly dark brown or black, tarsi entirely yellow in legs, but trochanters and basal ends of femora and tibiae yellowish brown and distal one-fifth to one-sixth of tibiae yellowish pale brown; proportion of leg segments about 46:47:27:13:4:5:10 in fore leg, 56:53:35:14:5:4:11 in middle leg, and 61:59:33:14:4.5:4:11 in hind leg. In fore leg, basal two segments each with apical tarsal spur and 3 with two apical spurs; in middle leg, basal three segments each with two apical spurs and with additional sub-basal spur; in hind leg, segment 1 with apical spur and following two segments each with two spurs. Tarsal segment 5 of fore and middle legs with pair of rather strong bristles on ventral sub-basal part; proportion of tarsal segment 5 and two claws about 40:38:19 in fore leg, 45:38:18 in middle leg, and 43:35:15 in hind leg.

Wing with macrotrichia on veins R,  $R_1$ ,  $R_s$ , distal half of  $M_1$ , distal one-third of  $M_2$ , and distal half of M $_{3+4}$ , those of membrane on apical areas of cells  $R_s$ ,  $M_1$ , and  $M_2$ . Venation:  $R_1$  ending at level of tip of  $Cu_1$  or beyond this level,  $R_s$  ending at level of mid-way between tips of  $M_2$  and M $_{3+4}$  or beyond this level, and costa extending to basal five-sixths of wing (105:127), second radial cell fully three times as long as first (32:10), fMCu under end of r-m, M $_{1+2}$  longer than r-m (7:5). Haltere with knob dark and stem yellow.

Abdomen with tergal side dark brown and sternal side pale yellowish brown; tergite 2 with large, obscure yellowish pattern. Two spermathecae brown, oval, and subequal (20 by 15 units and 20 by 13 units).

Holotype, male (US 64049), Colonia, Ponape, hydroelectric plant, Aug. 9, 1946, Townes. Allotype, female (BISHOP 2760), Mt. Temwetemwensekir, Ponape, 180 m., light trap, Jan. 19, 1953, Gressitt. Paratypes, ten males, two females (BISHOP, CM), Mt. Temwetemwensekir, Ponape, 180 m., light trap, Jan. 15-19, 1953, Gressitt.

DISTRIBUTION: Caroline Is. (Ponape).

This species is somewhat allied to *S. spadicitibialis*, but may be rather easily distinguished by the following differences: In this species, the thorax is entirely dark, the scutellum has more than five bristles with small accessory setae, the male abdomen is mainly white, and the parameres are flattened at the tip; in *spadicitibialis*, the thorax is much paler, brown or pale brown, the scutellum has five bristles and no small accessory setae, the male abdomen is mainly brown, and the parameres are slender and claw-like.

**116. *Stilobezzia spadicitibialis* Tokunaga and Murachi, n. sp. (fig. 84, d).**

Shining dark-brown; legs mainly brown or brownish; abdomen brown, but two basal segments paler; scutellum with five strong setae; wing hyaline and with sparsely distributed macrotrichia on apical area.

*Male:* Body about 3.09 mm. long. Wing about 1.45 mm. by 0.45 mm.

Head entirely brownish. Eyes separated above as wide as a facet. Maxillary palp five-segmented (6:14:20:12:19.5); segment 3 with several sensillae in small shallow pore beyond middle and subequal in length to last segment. Antenna with scape orange, segments 2 to 11 and plumose hairs pale brown, but distal three segments brown; last segment very long and subequal to preceding two combined; proportion of distal eight segments about 14:14:15:14:15:51:71:127; segments 2 to 8, 2 to 9, 2 to 10, 11 to 14, 10 to 14, and 9 to 14 in proportion of 30:34:37.5:52:65:69.

Thorax entirely dark brown, with shining dark-brown scutum in dry state, but thorax entirely brown in mounted specimen; scutellum with two pairs of lateral setae and strong median setae. Legs mainly brownish; middle femur paler on basal two-thirds and hind femur paler on basal one-fifth; tarsal segments paler and yellowish; in fore leg, basal two segments with apical spur and segment 3 with two distinct apical spurs, in middle leg, segment 1 with one sub-basal and two apical spurs and following two segments each with two distinct apical spurs; hind tarsi similar to middle, but without sub-basal spurs. Claws equal, small, and bifid at tip. Femora and following segments of legs in proportion of 40:42:27:15:4.5:3:6 in fore leg, 50:49:35:14:5:3.5:5 in middle leg, and 50:50:39:15:5:3:6 in hind leg.

Wing hyaline, with anterior veins pale brown; macrotrichia found only along distal margins of cells  $R_4$  and  $M_1$  and above tip of vein  $M_1$ . Venation: fMCu under origin of r-m,  $M_{1+2}$  somewhat longer than r-m but shorter than first radial cell,  $R_1$  and  $R_s$  ending at level of tips of  $Cu_1$  and  $M_{3+4}$ , respectively; second radial cell about three times as long as first (86:28). Haltere white.

Abdomen with two basal segments very pale brown and other segments and hypopygium uniformly brown. Hypopygium with tergite 9 as long as coxite, somewhat rounded caudad, and with pair of small setigerous laterocaudal lobes; sternite 9 broad, slightly concave at caudal margin and caudal membrane slightly spiculate; coxite with bases broad and swollen, about 1.5 times as long as basal width, abruptly narrowed about midway on mesal side; style rather strongly curved past middle and slightly tapered to pointed tips. Aedeagus with pair of lateral chitinizations which are pointed at tip and without flat lateral plates at thick middle parts; parameres slender, gradually tapered to sharp hooked tips, abruptly bent ventrocephalad at apical one-third, basal apodemes rather broad, pointed laterad, and cephalad.

*Female*: Body length 2.45-3.04 mm. Wing 1.45-1.63 mm. by 0.5-0.54 mm. Similar to male, but with usual sexual differences.

Head entirely brown. Segments of maxillary palp in proportion of 7.5:12.8:21.8:10.5:14. Antenna with scape yellow or pale yellowish brown; flagellar segments brown; AR about 1.87; distal eight segments in proportion of 5:5:5:12:12:12:12.5:17.5.

Leg with coxae, femora, and tibiae mainly black or dark brown in dry state but brown or slightly dark brown in mounted specimen; trochanters, basal ends of femora, and basal and apical ends of tibiae pale brown or yellowish brown, tarsal segments pale yellowish brown. Claws single, bifid at base, longer one longer than twice of shorter one. Proportion of leg segments about 42:43:27:15.8:3.5:3.5:7.8 in fore leg, and 54:53:30.5:14:4.4:3.3:7 in hind leg. Tarsal segment 1 of hind leg with one distinct apical spur.

Wing pale brown and hyaline, with anterior veins brownish, macrotrichia sparse, distributed on apical areas of cells  $R_4$  and  $M_1$ , distal corner of cell  $M_2$ , and on line above distal one-third of vein  $M_1$ . Venation: Second radial cell fully three times as long as first

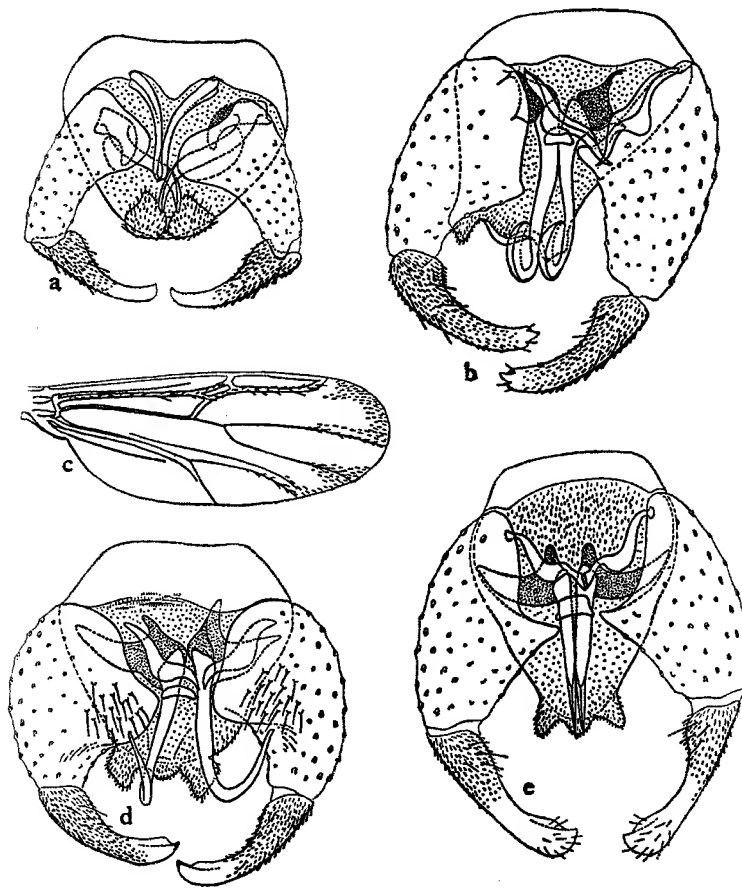


FIGURE 84.—Hypopygium, male. a, *Stilobezzia esakii*; b, *S. albiabdominalis* and c, wing, female; d, *S. spadicitibialis*; e, *S. gressitti*.

(103:33), fMCu just beyond origin of r-m,  $R_1$  ending at level of tip of  $Cu_1$ ,  $R_s$  ending far beyond tip of  $M_{3+4}$ ,  $M_{1+2}$  longer than r-m, but shorter than first radial cell.

Abdomen brown and two basal segments paler, but in dry state paler basal segments often indistinct. Two spermathecae subequal, oval, large and one minute, oval to round; all without chitinized ducts.

Holotype, male (US 64050), Wena (Moen), Truk, 183 m., July 31, 1946, Townes. Allotype, female (BISHOP 2761), Mt. Unibot, Ton, Truk, 390 m., light trap, Feb. 3, 1953, Gressitt. Paratypes, Truk: Four males, female, same data as for holotype; male (BISHOP), same data as for allotype; female, Mt. Unibot, Ton, Jan. 2, 1953, Gressitt. Ponape: Female, Mt. Temwetemwensekir, 180 m., light trap, Jan. 19, 1953, Gressitt.

DISTRIBUTION: Caroline Is. (Truk, Ponape).

This species is somewhat related to *S. esakii* Tokunaga, but the coloration of the legs is distinctly different.

**117. *Stilobezzia gressitti* Tokunaga and Murachi, n. sp. (fig. 84, e).**

Rather large, yellowish-brown; hind legs more or less dark brown. Coloration closely allied to that of *S. spadicitibialis*, but male hypopygium with parameres flattened apically, forming round lamellae and scutellum more setigerous with eight strong bristles and two to five small accessory setae.

*Male*: Body 2.1-2.28 mm. long. Wing 1.61-1.69 mm. by 0.47-0.48 mm.

Head brown, with eyes barely separated above, clypeus with four pairs of setae; maxillary palp slender, with five segments in proportion of 7:15:25.5:13:24. Antenna with scape yellow, segments 2 to 10 and plumose hairs yellowish pale brown or pale brown, segment 11 yellowish pale brown basally and brown apically, segments 12 to 14 brown; segments 2 to 9, 2 to 10, 2 to 11, 10 to 14, 11 to 14, and 12 to 14 in proportion of 36.5:40.3:45.3:79.5:75.5:70.5; distal seven segments in proportion of 15.5:14.5:15.5:19:52:83.5:142.

Thorax with tergal side uniformly yellowish pale brown or yellowish brown; scutellum with eight strong bristles and two or three small accessory setae. Legs somewhat more brownish than scutum; in fore legs, coxae, femora, and tibiae pale brown or yellowish brown and more brownish than tarsi and trochanters; in middle legs, coxae and middle one-third of both femora and tibiae more brownish than in fore legs; in hind legs, coxae, middle three-fifths or four-fifths of femora and middle one-half or three-fourths of tibiae dark brown or brown, distinctly darker than other legs; tarsal segments yellowish pale brown; proportion of leg segments, except for coxae and trochanters, about 47.5:45:25:14:5.8:4.5:9.5 in fore leg, 56:50.5:32.5:15.5:6.3:4.3:8.8 in middle leg, and 56.6:56:29.5:14.5:5.8:4:9.8 in hind leg. In fore leg, three basal segments each with apical tarsal spur; in middle leg, 1 with sub-basal and apical spur, 2 with two apical spurs, and 3 with one or two apical spurs; in hind leg, basal two segments each with apical spur and 3 with one or two apical spurs; tarsal segment 5 of all legs without distinct spurs.

Wing with veins and membranes very pale brown; macrotrichia arranged on veins  $R$ ,  $R_1$ ,  $R_s$ , on distal half of  $M_1$  and at end of  $M_2$ ; those of membrane in apical marginal areas of cells  $R_s$  and  $M_1$ . Venation:  $R_s$  much longer than three times of  $R_1$  (41:12) and ending far beyond level of tip of  $M_{3+4}$ , second radial cell about three times as long as first (29.5:9.5), fMCu under r-m,  $fM_{1+2}$  under tip of first radial cell. Haltere pale yellow.

Abdomen yellowish pale brown. Hypopygium brown, with parameres dark brown; sternite 9 transverse and narrow, its caudal margin very shallowly concave, its caudal membrane broad and uniformly spinulose; tergite 9 elongate, longer than basal width, paraboloid and round at caudal end; coxite somewhat triangular in ventral aspect, much



longer than basal width; style stout, slightly arcuate, somewhat clavate at tip, and each with blunt apical tooth. Aedeagus broad, somewhat trapezoid, its lateral sclerites strongly curved, each with apical end obliquely truncate and semicircular lateral expansion at shoulder part; parameres with basal two-thirds moderately thickened and apical one-third gradually narrowed and vertically expanded, forming round and very thin lamellae; apodemes of parameres rather large, sickle-shape, laterally extended, and ending on dorsal side of basal margins of coxites, mesal anterior roots prominent and blunt.

*Female*: Body length 2.51 mm. Wing about 1.8 mm. by 0.59 mm. General specific characters as in male, except for usual sexual differences.

Head with palpal segments in proportion of 7:20:30:12.5:19. Antenna with scape yellow, other segments all brown; AR about 1.62; distal eight segments in proportion of 20:22:23:51:53.5:56:54:74.

Thorax entirely yellowish pale brown; scutellum with eight strong bristles and five small accessory setae. Fore and middle legs mainly yellowish brown and hind legs generally dark brown; in fore leg, coxae slightly more brownish than other segments; in middle leg, coxa, femur, and tibia somewhat more brownish than in fore leg; in hind leg, trochanter, knee joint, base of femur, and entire tarsal segments yellowish brown; proportion of leg segments about 48:47:26:13:5:4.5:9 in fore leg, 58:53:33:14:5:4.5:10 in middle leg, and 59:58:32:13:5:4.5:10 in hind leg. In fore leg, two basal segments each with apical tarsal spur and 3 with two apical spurs; in middle leg, 1 with sub-basal and apical spurs and following two segments each with two apical spurs; in hind leg, 1 without distinct spurs, 2 with apical spur, and 3 with two apical spurs; tarsal segment 5 without conspicuous spurs.

Wing with veins and membrane pale brown; macrotrichia of veins present on R, R<sub>1</sub>, R<sub>s</sub>, apical half of M<sub>1</sub>, and distal one-third of both M<sub>2</sub> and M<sub>2+3</sub>; those of membrane present on apical marginal areas of cells R<sub>s</sub>, M<sub>1</sub>, and M<sub>2</sub>. Venation: R<sub>s</sub> much longer than four times of R<sub>1</sub> (50:13) and ending before level of tip of M<sub>2</sub>, second radial cell about four times as long as first (35:9), fMCu under end of r-m, fM<sub>1+2</sub> just beyond level of end of Cu<sub>1</sub> and just before tip of first radial cell. Haltere very pale brown.

Abdomen pale brown, but three or four caudal segments slightly more brownish; two spermathecae equal, oval, and brown; one very small, brown, and round; chitinized ducts of thecae all absent.

Holotype, male (US 64051), Mt. Temwetemwensekir, Ponape, 180 m., light trap, Jan. 19, 1953, Gressitt. Allotype, female (US), Nanipil, Ponape, Feb. 25, 1948, Dybas. Paratype, male (BISHOP), same data as for holotype.

DISTRIBUTION: Caroline Is. (Ponape).

This species is closely related to *S. spadicitibialis*, but in the latter the scutellum has only five strong bristles and no small accessory setae and the parameres of the male hypopygium are slender, long, and claw-like; while in this species the scutellum has at least seven strong bristles and usually, especially in the female, several small accessory setae.

**118. *Stilobezzia fuscigenua* Tokunaga and Murachi, n. sp. (fig. 85, a).**

Yellow; scutum with brown vittae, of which median vittae are subconfluent and extend from cephalic margin to midway of scutum and paired lateral vittae arise from anterior one-third and extend to scutellum; scutellum with eight to nine strong setae. Legs mainly pale yellow but all knee joints distinctly brown.

*Female*: Body length about 3 mm. Wing about 1.81 mm. by 0.63 mm.

Head pale brown or yellowish brown. Eyes narrowly separated above as wide as a facet. Mouthparts yellowish brown, with maxillary palpal segments in proportion of 10:20:32:17:27. Antenna with scape yellow, segments 2 to 9 yellow, 7 to 9 each with narrow

brown ring at tip, 10 to 14 brown but each base pale brown; AR about 1.60; distal eight segments in proportion of 6:6:7:14:15:15:15:21.5.

Thorax pale yellowish, with brown setae; scutum with pair of median subconfluent brown vittae from cephalic margin to midway of scutum and pair of lateral brown vittae from cephalic one-third to caudal margin of scutum; scutellum with four pairs of strong brown setae; postscutellum yellowish brown. Legs pale yellowish brown to pale yellow; but knee joints distinctly brown; in fore leg, coxa and trochanter pale brown and, in other legs, these two basal segments pale yellow; following segments all similar in color: femora and tibiae pale yellowish brown, but femoral bases pale brown and knee joints distinctly brown; tarsal segments pale yellow. In fore and hind leg, three basal segments each with distinct apical spur; in middle leg, these segments each with two apical spurs; and in segment 1 an additional spur at sub-basal part. Proportion of leg segments: 55:53:30:15:6:5:11.5 in fore leg, 60:59:37:16:6:5.5:9 in middle leg, and 65:66:36:15:6:5:11 in hind leg. Claws single, bifid, longer tooth twice as long as shorter one.

Wing hyaline, with anterior veins pale yellowish brown, macrotrichia sparsely distributed along marginal areas of cells  $R_5$  and  $M_1$  and on anterior and posterior distal corners of cell  $M_2$ , on veins  $R$ ,  $R_1$ ,  $R_s$ , and distal parts of  $M_1$ ,  $M_2$ , and  $M_{3+4}$ . Venation:  $R_1$  ending slightly beyond tip of  $Cu_1$ ,  $R_s$  far beyond tip of  $M_{3+4}$ , fMCu under r-m,  $M_{1+2}$  shorter than first radial cell, but longer than r-m, second radial cell longer than three times of first (34:10.2). Haltere pale yellowish brown in dry state, but white in mounted specimen.

Abdomen yellowish brown or pale yellow entirely, including cerci. One large spermatheca, elongate, oval; one rather large, oval; one minute and round; chitinized ducts all absent.

*Male:* Body length 2.7-2.9 mm. Wing about 1.7 mm. by 0.5 mm. General specific characters similar to those of female except for usual sexual differences.

Coloration of dry specimen as follows: Body almost entirely yellowish brown, but scutum somewhat shining and with median brown vitta on anterior half and two lateral brown vittae on caudal half; scutellum dull yellow; postscutellum also dull yellow, but its caudal margin dark brown. Thoracic setae black. Antenna brown. Legs mainly yellowish pale brown and all knee joints black. Haltere dull yellow. Abdomen dull yellow but hypopygium dark.

Head yellow and slightly fuscous on vertex; eyes just contiguous above; mouthparts yellow; clypeus with about six pairs of small setae. Maxillary palpal segments in proportion of 8:15:25:12:24. Antenna with scape yellow; segments 2 to 11 pale yellow, with plumose hairs pale brown; segments 12 to 14 pale brown; proportion of distal eight segments about 17:17.5:18:18:20:50:80:155; segments 2 to 10, 2 to 11, 11 to 14, and 12 to 14 in proportion of 173:193:305:285.

Thorax yellow; scutum with three obscure, pale-brown vittae; scutellum with nine strong bristles and without small accessory setae; postscutellum pale brown along caudal margin. Legs yellow, but all knee joints black. In fore leg, two basal segments each with apical tarsal spurs and 3 with two apical spurs; in middle leg, three basal tarsal segments each with two apical spurs and segment 1 with sub-basal spur; in hind leg, 1 without distinct spurs, 2 and 3 each with two apical spurs; segment 5 without distinct spurs. Claws equal, small, and simple. Leg segments, except for basal two, in proportion of 50:48:29:16:5.5:4:9.5 in fore leg, 60:56:37.5:17:6:4:8.5 in middle leg, and 63:63:33:14:5:4.5:10 in hind leg.

Wing with membrane and veins yellowish pale brown, macrotrichia along wing margins of cells  $R_5$  and  $M_1$ . Venation:  $R_1$  ending above tip of  $Cu_1$ ,  $R_s$  ending at about four-fifths of wing (104:130) and above tip of  $M_{3+4}$ , fMCu under origin of r-m,  $M_{1+2}$  much longer than r-m (8.5:4.5), two radial cells in proportion of 9:25 in length,  $R_1$  about one-third of  $R_s$  (12:37). Haltere yellowish white.

Abdomen yellow. Hypopygium dark brown, tips of style and parameres black; tergite 9 narrowed caudad, rather long, both sides slightly concave; sternite 9 distinctly narrowed at base, its caudal margin distinctly projected caudad, forming triangular lobe;

coxite large, suboval or subtriangular, about one and one-half times as long as basal width; style stout, slightly arcuate, each truncate at tip and with blunt apical tooth, shorter than coxite (42:55). Aedeagus with rather slender lateral sclerites, caudal quarter suddenly narrowed, without distinct lateral expansion, apical lobes paired and thinly membranous; parameres thickened at base, tapering, apical one-fourth flattened vertically and each forming round lamella at tip; basal apodemes of parameres very large, triangular, laterally extended, and ending at basal lateral corners of coxites.

Holotype, female (US 64052), southwest Koror I., Palau Is., light trap, Dec. 4, 1952, Gressitt. Allotype, male (BISHOP 2599), Koror I., Palau Is., at light, Apr. 16, 1953, Beardsley. Paratypes, female, same data as for holotype; female, Koror I., Palau Is., light trap, Dec. 5, 1952, Gressitt.

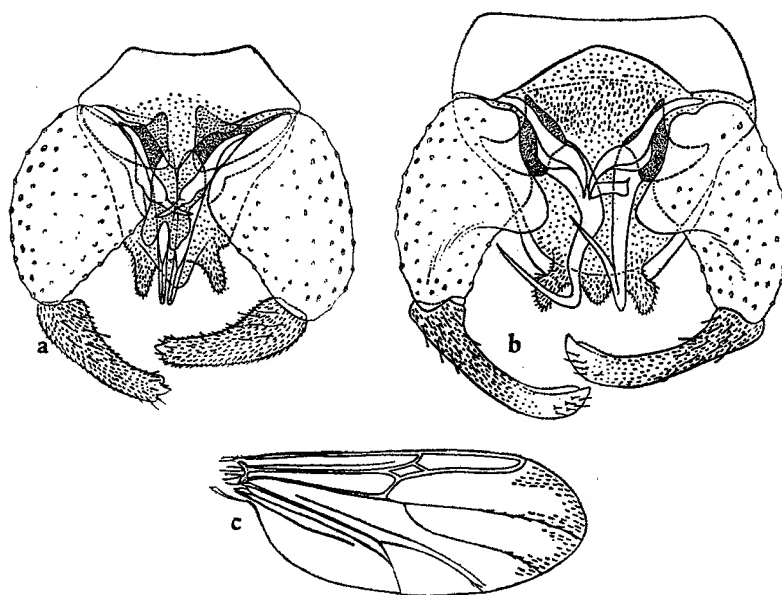


FIGURE 85.—Hypopygium, male. a, *Stilobezzia fuscigenua*; b, *S. fusciscutellata* and c, wing, female.

#### Other specimens:

Palau. Five females, eight males, Ngerehelong Pen., Babelthuap, May 6-8, 1957, Sabrosky; three females, male, Ngiwal, Babelthuap, May 19, three females, male, May 20-21, 1957, light trap, Sabrosky; two females, male, Ngaremlengui, Babelthuap, June 3, female, June 30, 1957, Sabrosky; five females, Melekeiok, Babelthuap, May 22, 1957, Sabrosky; female, Peleliu, May 28, 1957, Sabrosky; female, male, Koror, Apr. 28, seven females, May 16, 29, 30, female, May 26, 1957, light trap, Sabrosky.

Yap. Female, Dugor, May 14, 1957, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau, Yap).

This species is quite characteristic in the possession of brown thoracic vittae on the yellowish scutum and of distinct brown knee joints on the yellowish legs, differing from other known Micronesian species. It is named in relation to the specific brown knee joints.

**119. *Stilobezzia fusciscutellata* Tokunaga and Murachi, n. sp. (fig. 85, b, c).**

Yellowish-brown; scutellum dark yellow and postscutellum brown; scutum mainly yellowish brown, but caudoscuteal area with large brown median spot and pair of dark-yellow lateral stripes. Scutellum somewhat brownish, with five to seven strong setae. Legs pale yellowish brown, except for brownish-yellow fore coxae and somewhat brownish apical parts of all femora.

*Male:* Body length about 2.77 mm. Wing about 1.86 mm. by 0.54 mm.

Head brown; mouthparts pale brown. Eyes separated above as wide as half a facet. Maxillary palp with segments in proportion of 10:15:27.5:12:14. Antenna with scape orangeish brown; short basal flagellar segments and their plumose hairs very pale yellowish brown; long distal flagellar segments brown. Proportion of segments 2 to 9, 2 to 10, 2 to 11, 10 to 14, 11 to 14, and 12 to 14 about 130.2:143:157.6:266.2:253.4:238.8. Flagellar segments 7 to 14 in proportion of 15.5:16:15.5:15:16:59:83:148.

Thorax mainly yellowish brown, with erect brown setae; caudoscuteal area dark yellow on lateral sides, brown on mesal area, and these areas separated by pair of yellowish-brown vittae. Scutellum entirely dark brown or dark yellow and with seven distinct setae. Postscutellum uniformly brown. Legs with fore coxa brownish yellow and other segments all pale yellowish-brown. Leg segments in proportion of 51:53:33:18:5:4.5:8.5 in fore leg, 63:61:42:19:6:4.5:9 in middle leg, and 65:68:37:18.5:6.5:5:9 in hind leg. In fore and hind legs, two basal segments each with distinct apical tarsal spur and 3 with pair of distinct spurs; in the middle leg, three basal segments each with pair of distinct apical spurs and additional spur on sub-basal end of segment 1.

Wing including anterior veins very pale and hyaline, with macrotrichia on R and R<sub>1</sub> and on distal one-third of M<sub>1</sub>, in line along distal margin of cells R<sub>5</sub> and M<sub>1</sub> and above distal part of M<sub>1</sub>. Venation: fMCu under origin of r-m, R<sub>1</sub> ending before tip of Cu<sub>1</sub>, R<sub>5</sub> ending before tip of M<sub>3+4</sub>, first radial cell about one-third of second (30:105) and sub-equal to r-m or M<sub>1+2</sub> in length. Haltere pale yellow.

Abdomen pale yellowish brown and anterior segments very pale. Hypopygium yellowish brown, but lateral plates of aedeagus and parameres brown. Sternite 9 widely and shallowly concave in V-shape on caudal margin. Coxite very slightly curved and narrowed and each with blunt swelling at base; style strong, slightly curved before tip, not tapered, but somewhat thicker apically, and each ending in brown tooth. Aedeagus with pair of slender curved lateral plates, which are narrow on basal one-third, sharply pointed on distal one-third, and bluntly round laterad beyond middle; parameres slender, sharply pointed, curved ventrocephalad on apical two-fifths, with stem parts undulate; basal apodemes broad, as long as wide, somewhat pointed at two basal angles, and concave at basal margins.

*Female:* Body length about 2.8 mm. Wing about 1.59 mm. by 0.55 mm.

Head dark brown, with mouthparts pale brown; eyes separated above as wide as a facet. Maxillary palp five-segmented (8:15:23:13:18). Antenna with scape yellowish brown; following six segments pale brown, segments 8 to 9 pale brown on each basal part and brown on each apical part, segments 10 to 14 brown. AR about 1.87. Proportion of distal nine antennal segments about 15.5:16:20:21:45:49:54:53:82.

Thorax somewhat darker than in male; scutellum brownish black, postscutellum dark brown, scutum yellowish pale brown in ground color and with pale-brown or brown, broad median vitta, pair of pale-brown short vittae along lateral sides of anterior half and pair of dark-brown vittae along lateral sides of posterior half. Scutellum black, with five strong setae.

Legs almost entirely yellowish pale brown, but more or less brownish on apical parts of all femora: apical one-fourth of fore femora, one-third of middle femora, and one-half of hind femora. Leg segments, except for coxae and trochanters, in proportion of 45:45:26:13:4:4:10 in fore leg, 54:53:35:15:5:4.5:10 in middle leg, and 55:57:30:14:4.5:4.5:9 in hind leg. On fore leg, three basal segments each with apical tarsal spur; in middle leg, segment 1 with sub-basal and apical spur and following two segments each with pair of apical spurs; in hind leg, segment 1 with apical and following two each with two apical spurs. Proportion of claws and tarsal segment 5 about 36:16:40 in fore leg, 39:18:42 in middle leg, and 33:14:37 in hind leg.

Wing venation: fMCu under end of r-m,  $R_1$  ending just beyond tip of Cu<sub>1</sub>, Rs ending just at middle between tips of  $M_2$  and  $M_{3+4}$ , r-m as long as  $M_{1+2}$  and much shorter than length of first radial cell (7:10), second radial cell about three times as long as first cell (33:10), Rs four times as long as  $R_1$  (44:11). Macrotrichia very sparse, distributed only on distal parts of cells  $R_5$  and  $M_1$  and at distal corner of cell  $M_2$ .

Abdomen mainly yellowish white, but caudal four segments somewhat pale brown. Two spermathecae, oval, brown, unequal (29 by 17 units and 21 by 13 units), and without chitinized ducts and one small (5 by 5 units), round, and pale brown. Other specific characters mainly as in male except for usual sexual differences.

Holotype, male (US 64053), Wena (Moen), Truk, 180 m., July 31, 1946, Townes. Allotype, female (BISHOP 2762), Mt. Unibot, Ton, Truk, 390 m., light trap, Feb. 3, 1953, Gressitt. Paratypes, Yap: Male, hill behind Yaptown, Yap, 50 m., light trap, Dec. 3, 1952, Gressitt. Truk: Male, same data as for holotype; male, Wena, June 1, 1946, Townes; male (BISHOP), Mt. Unibot, Ton, 280 m., light trap, Dec. 30, 1952, Gressitt; two males, 25-50 m., lower native forest, Jan. 1, 1953, Gressitt; male, 380 m., Jan. 2, 1953, Gressitt; female, 390 m., light trap, Feb. 3, 1953, Gressitt.

DISTRIBUTION: Caroline Is (Yap, Truk).

This species is allied to the Micronesian *S. longistyla*, but in the latter the parameres of the male hypopygium are extended caudad and filiform, and the scutum, scutellum, and postscutellum are uniformly pale, not brownish or dark. It is named in relation to the characteristic dark scutellum.

#### Subgenus *Neostilobezzia* Goetghebuer and Lenz

*Neostilobezzia* Goetghebuer and Lenz, 1934, IN Lindner, Flieg. Palaearct. Reg. 13A: 53.

#### *Stilobezzia calcaris* group.

The five following species are closely related to each other and belong to the subgenus *Neostilobezzia* as defined by Wirth. They are placed in the provisional category of *calcaris* group.

Tibial apical spur of fore leg distinctly well developed, usually longer than diameter of distal end of tibia and brown to dark; wing with sparse macrotrichia on membrane only along apical margins of cells  $R_5$  and  $M_1$ ; styles of male hypopygium more or less flattened apically.

The differences between these species, except *unifascidorsalis* with the characteristic vitta on the scutum, are so slight that it is possible to separate only the males.

#### KEY TO MICRONESIAN SPECIES OF CALCARIS GROUP

1. Thorax white; scutum with one median vitta on anterior half short, brown or dark and distinct.....120. *unifascidorsalis*  
 Thorax almost uniformly pale brown, yellowish or slightly fuscous; scutum without distinct vittae..... 2
2. Females.....121. *calcaris*, 122. *tenuiforceps*, 123. *latiforceps*, 125. *truncata*  
 Males ..... 3
3. Tibial apical spur of fore leg very large, more than 0.4 as long as tarsal segment 1; styles of hypopygium broadened apically more than twice narrowest middle part and usually with distinct apical emargination..... 4  
 Tibial apical spur of fore leg strong, but shorter than 0.4 tarsal segment 1; styles of hypopygium broadened apically less than twice narrowest middle part and usually with apical emargination indistinct..... 5
4. Scutellum usually with five bristles and at most six including smaller one .....123. *latiforceps*  
 Scutellum with nine bristles.....124. *latiforceps setigera*
5. Paramere of hypopygium round at apical end and with minute obtuse or triangular process on preapical part; styles of hypopygium not distinctly broadened apically.....122. *tenuiforceps*  
 Paramere of hypopygium tapered, curved and sharply pointed apically; styles of hypopygium distinctly broadened apically or not..... 6
6. Styles of hypopygium distinctly broadened apically; paramere with minute hyaline spot on caudal margin of preapical part.....121. *calcaris*  
 Styles of hypopygium not distinctly broadened apically; paramere without hyaline spots on preapical part.....125. *truncata*

The male sex of these species, although showing a rather wide range of variation of coloration and size of various parts, seems to have the following tendency, except for *S. unifascidorsalis*: *S. latiforceps* and *S. truncata* are somewhat larger and more brownish or fuscous than *S. calcaris* and *S. tenuiforceps*, which are paler or more whitish; *S. latiforceps* is largest; and *S. tenuiforceps* is smallest.

Concerning the female sex of the most intimately related four species of this group, I have made every effort to find their specific structural differences or to obtain their specific values after measurement and calculation of lengths and widths of various parts of the body, but I could not get distinctive specific characters for the females. However, the compound variation-curve of the wing size (length and width) obtained from the observation on 50 non-selective female specimens seems to fall into four individual variation-curves which are thought to represent four different species. These curves partly overlap, of course, showing the presence of some intermediate specimens between two adjacent species. The overlapping parts of the curves are far less in

the length than in the width of wings and the experimental errors are vice versa. Relating mainly to the length of the wing, the mean value (MV) and the range of variation (RV) of each curve are as follows: The first junior curve is rather distinctly isolated from the next and its MV is 1.058 mm. by 0.378 mm. and RV is 1.014-1.092 mm. by 0.345-0.403 mm.; the second curve somewhat overlaps the third and, except this overlapping part, its MV is 1.149 mm. by 0.409 mm. and RV is 1.118-1.17 mm. by 0.39-0.442 mm.; the third curve somewhat overlaps the second and more on the fourth senior curve and, except for these overlapping parts, its MV is 1.129 mm. by 0.428 mm. and RV is 1.196-1.275 mm. by 0.403-0.481 mm.; the fourth curve shows rather wide range of variation and, except for the rather wide overlapping part on the third, its MV is 1.394 mm. by 0.476 mm. and RV is 1.326-1.469 mm. by 0.429-0.501 mm. Taking the size of the male into consideration of these four variation curves of the female, the first junior group seems to represent *S. tenuiforceps*, the second *S. calcaris*, the third *S. truncata*, and the fourth senior *S. latiforceps*. It is regretted that by this method there remain many unidentified female specimens which fall within the overlapping parts of the four variation curves. Consequently the descriptions of the female sex tentatively given under respective chapters are mainly based on the observations of several selected specimens which have the wings very similar in size to the mean value and the determination of the female type specimen is somewhat questionable until females are obtained by rearing or breeding, or until discovery of any better structural specific character or until mating pairs are caught.

Specimens (females not accurately identified as to whether they belong to *S. calcaris*, *S. tenuiforceps*, *S. latiforceps* or *S. truncata*), Palau: two, Ngerehelong Pen., Babelthuap I., Apr. 7, 1957, Sabrosky; six, Ulimang, Babelthuap I., Dec. 10, 16, 1947, Dybas; two, Ngaremlengui, Babelthuap I., May 6-8, 1957, Sabrosky; three, Melekeiok, Babelthuap I., May 23-24, 1957, Sabrosky; one, East Ngatpang, Babelthuap I., Dec. 1952, Gressitt; two, Airai, Babelthuap I., May 16, 26, 1957, Sabrosky; three, Koror I., Apr. 27, May 2, 1957, Sabrosky; one, Ngarmalk I., Apr. 24, 1957, Sabrosky. Yap: One, Rumung I., June 17, 1957, Sabrosky; two, Gagil District, Yap I., Apr. 19, 1957, Sabrosky.

**120. *Stilobezzia* (*Neostilobezzia*) *unifascidorsalis* Tokunaga, n. sp. (fig. 86).**

Small, pale yellowish-white. Scutum with dark median short vitta on anterior half. Female antenna with AR about 1.56. Fore legs with dark-brown tibial spur longer than diameter of tibial end; hind TR about 2.19 in male and 2.37 in female. Male hypopygium yellowish, with aedeagus, parameres, and apical ends of styles dark or brown, styles flattened apically and fishtail-like; parameres apically pointed and curved ventrad. Spermathecae oval and unequal.

*Male:* Body length about 1.54 (1.5-1.6) mm. Wing about 1.19 (1.16-1.21) mm. by 0.38 mm. Coloration mainly pale yellowish white.

Head mainly yellow, with vertex slightly brownish, eyes bare and separated above as wide as a facet, clypeus with three and rarely four setae on either lateral side, proboscis

about 0.37 as long as height of head capsule (10:27). Maxillary palp slender, with group of sensillae on ventral side of apical half of segment 3, with five segments in proportion of 5.5:13:16.5:9.5:15.5. Antenna mainly yellow, but plumose hairs and distal three segments slightly brownish, terminal stylet small and slender; combined relative length of segments 2 to 11 and those of distal three together about 180:144; relative length of distal eight segments about 13:12.5:12:12:13.5:36:52.5:91.5.

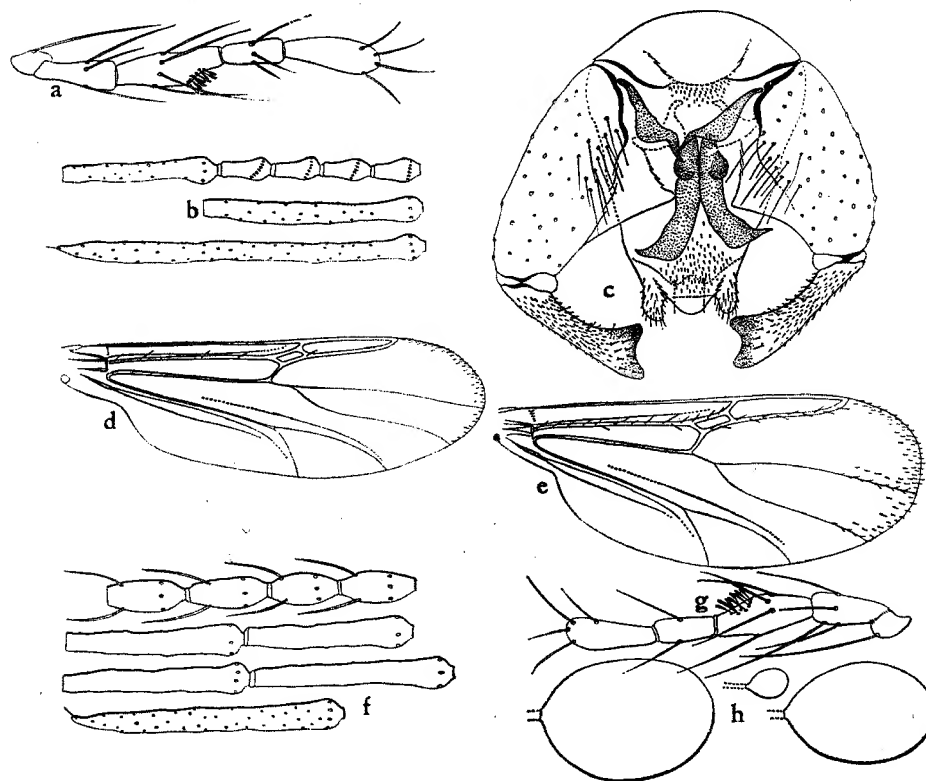


FIGURE 86.—*Stilobezzia* (*Neostilobezzia*) *unifascidorsalis*. a-d, male: a, maxillary palp; b, distal seven antennal segments; c, hypopygium; d, wing. e-h, female: e, wing; f, distal nine antennal segments; g, maxillary palp; h, spermathecae.

Thorax pale yellowish white; scutum with median dark vitta on anterior part before level of scutal sutures; scutellum with five bristles, but rarely with four. Legs also mainly pale yellowish white, except for brown articulations of segments; fore leg with strong dark apical spur far longer than diameter of apical end of tibia and about 0.37 (0.36-0.37) as long as tarsal segment 1; hind leg with TR about 2.2 (2.17-2.24) and tibial comb of five or six bristles; in fore and hind legs, basal three tarsal segments each with apical spur, in middle, 1 with sub-basal and two apical spurs, 2 with two apical and 3 with an apical spur; leg segments, except for basal two, in proportion of 137.5:130.5:66:33:14.5:12.5:20.5 in fore, 160:143.8:95:35.5:14.5:11.5:17.5 in middle, and 160:153:81.5:37:14.5:11.5:21 in hind leg.



Wing with veins pale yellow and macrotrichia only along apical margins of cells  $R_4$  and  $M_1$ . Venation: Costa ending at basal 0.78 of wing length (71:90.5) and slightly beyond tip of  $M_{2+4}$ ,  $R_s$  about 3.5 times as long as  $R_1$  (27:7.8), second radial cell about three times as long as first (19:6), r-m as long as  $M_{1+2}$ , relative length of R, M, and stem of fMCu about 34.5:34.5:39.3, fMCu under r-m,  $M_{2+4}$  about 2.5 times as long as  $Cu_1$  (24.5:10). Haltere entirely white.

Abdomen entirely white, tergal and sternal sclerites absent; hypopygium with parameres, lateral sclerites of aedeagus and apical margins of styles dark; tergite 9 elongate, subtriangular and with anal points papilliform, sternite 9 without caudal emargination and with caudal membrane slightly spinulose on anterior margin; coxites subtriangular in ventral aspect, each with ventral setigerous swelling and not beyond caudal margin of tergite; styles far shorter than coxites (37:43), gradually broadened apically, with shallow apical emargination showing fishtail-shape and two apical tips round; aedeagus with lateral sclerites sharply pointed at apices and round on lateral margins; parameres strong, almost as long as styles (33:37), with basal quarter strongly thickened, apical quarter curved ventrad and suddenly narrowed ending in sharp apices.

*Female*: Body length about 1.35 (1.23-1.46) mm. Wing about 1.2 (1.17-1.24) mm. by 0.43 (0.42-0.44) mm. Coloration and general structures as in male with usual sexual differences.

Head with proboscis about 0.4 as long as length of head capsule (11:29), clypeus with three lateral setae on either side. Maxillary palp with five segments in proportion of 6.3:12.7:17:9.7:13.5. Antenna with scape yellow, other segments pale brownish yellow, basal short flagellar segments elongate, oval and fully three times as long as wide; AR about 1.56 (1.44-1.63); relative length of segments 2 to 4 and distal eight segments about 21.7:16.2:15.7 and 15.2:16:17:35.3:37.8:40:37.3:54.3 respectively.

Thorax very closely as in male. Legs as in male, but claws single and unequally bifurcate at base, in fore leg, claws longer than or subequal to last segment (29.3 and 13.3:29), in middle, slightly longer than the segment (31.7 and 15.2:29.3) and in hind leg, slightly shorter than the segment (24.2 and 9:27); tarsal spur developed as in male, but, in middle leg, penultimate segment with an apical spur; tibial comb of hind leg usually with six bristles and rarely with five or seven; fore leg with strong dark tibial spur which is longer than width of tibial end, about 0.26 (0.24-0.28) as long as tarsal segment 1; relative length of leg segments, except for basal two, about 142.3:138:71.7:35.3:14.3:13:29 in fore, 171:165.7:103.5:39:15.7:13.7:29.3 in middle, and 165.3:165:90.7:37.5:14.3:12.7:27 in hind leg; hind TR about 2.37 (2.18-2.44).

Wing with many setae on radial veins, macrotrichia spread closely along apical margins of cells  $R_4$  and  $M_1$  and on apical half of vein  $M_1$  and apical quarter of  $M_2$  and arranged in line along anterior side of apical one-third of  $M_1$ . Venation: Costa ending at basal 0.8 of wing length (76:92.3) and slightly before end of  $M_2$ ,  $R_s$  about 3.8 times as long as  $R_1$ , second radial cell about three times as long as first (23:8), r-m equal to  $M_{1+2}$ , relative length of R, M, and stem of fMCu about 34.3:34.3:38.8, fMCu under or just before r-m,  $M_{2+4}$  about twice as long as  $Cu_1$  (25.7:12).

Abdomen white; tergal and sternal sclerites reduced; two spermathecae, pale brown, well developed, oval, unequal (24 by 14.3 units and 20.7 by 12 units) and each usually without neck part, but rarely with minute neck part, one almost hyaline, colorless, small and oval (6.2 by 4.8 units).

Holotype, male (US 64615), Ngaremlengui, Babelthuap I., Palau Is., June 31, 1957, Sabrosky. Allotype, female (US), same locality as for holotype, June 30, 1957, Sabrosky. Paratypes, Palau: Eight females, six males (BISHOP, US), Ngaremlengui, Babelthuap I., June 1, 3, 30, 31, 1957, light trap, Sabrosky; three females, Imeliik, Babelthuap I., June 6, 1957, light trap, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau).

This species belongs to *calcaris* group and is closely allied to the Micronesian *S. calcaris* and *latiforceps*. These allied species, however, are mainly different in the following points: In the first allied species, the scutum is without dark median vitta even in paler or yellowish specimens, the styles of male hypopygium are not fishtail-like at apical parts, being only very slightly emarginate on apical margins and parameres with hyaline spots on caudal margins of preapical parts. In the second allied species, the tibial spur of the male fore leg is more developed, about 0.43 times as long as tarsal segment 1, and the style of the male hypopygium is strongly flattened apically, fully two times as wide as narrowest middle part and the dorsal angle of apical part usually more pointed than the ventral angle.

**121. *Stilobezzia* (*Neostilobezzia*) *calcaris* Tokunaga and Murachi, n. sp.**  
(fig. 87, a-f).

Minute, yellow to brown; tibiae of fore legs with long, curved, and darker or more brownish apical spurs than in hind legs; scutum pale yellowish brown to pale orangeish brown; scutellum with five setae and rarely with four or six; fore coxae and trochanters not, or very slightly, more brownish than in other legs.

*Male*: Body length about 2.26 mm. Wing about 1.15 mm. (1.07-1.29 mm.) by 0.39 mm.

Head pale brown to brown, with vertex more brownish; mouthparts pale brown or brown. Eyes slightly separated above by less than half a facet. Maxillary palp with segments in proportion of 6:13.1:18:9.9:18.8. Antenna with scape pale brown, yellowish brown, orange brown or brown, flagellar segments and plumose hairs pale brown or brown; segments 2 to 9, 2 to 10, 2 to 11, 10 to 14, 11 to 14, and 12 to 14 in proportion of 128:140.1:156.3:221.1:208:193.1, proportion of seven distal segments about 13.4:13.4:13.1:14.5:39.1:57:95.6.

Thorax pale yellowish brown, but rarely pale brown or brown, without colored markings; setae brown; scutellum usually with four or five setae, two pairs of strong setae and small median seta, but, in smaller specimens, median seta absent, rarely with six. Legs entirely pale yellowish brown or yellowish white and rarely fore coxae and trochanters very slightly more brownish than in other legs; leg segments in proportion of 39:37.5:18.8:9.9:4.5:3.6:5.8 in fore leg, 46:42:26.6:11.6:4.9:3.6:5.7 in middle leg, and 45.8:44:20.9:11.1:4.6:3.6:5.6 in hind leg. Fore legs with tibial spurs 0.35 (0.34-0.36) as long as tarsal segment 1; hind legs with tibial combs bearing five or six bristles and TR 2.156 (2.111-2.212).

Wing with anterior veins pale brown to pale yellowish brown; macrotrichia three to five on R, several on distal one-third or one-fourth and rarely few on tip of M<sub>2</sub>, absent on R<sub>1</sub> and R<sub>s</sub>, line of trichia along distal margins of cells R<sub>s</sub> and M<sub>1</sub>. Venation: R<sub>1</sub> ending above tip of Cu<sub>1</sub>, R<sub>s</sub> ending above or slightly beyond tip of M<sub>2+3</sub>, second radial cell longer than three times of first radial cell (76:22), fMCu under r-m or under origin of r-m, M<sub>1+2</sub> subequal to, or slightly longer than, r-m but shorter than first radial cell. Haltere pale yellow to pale yellowish brown.

Abdomen uniformly pale brown. Hypopygium yellowish brown or brown; tergite 9 as long as basal width, gradually narrowed caudad and round at caudal margin; sternite 9 transverse, widely and shallowly concave at caudal margin; coxite broad on basal half, narrowed beyond middle of mesal margin; style gradually broadened apically, with apex 1.5 or 2.0 times as wide as sub-basal narrowest parts, apical corners not pointed but bluntly round and apical margin very shallowly and irregularly concave or almost straight and very rarely fishtail-shape as in *unifascidorsalis*. Aedeagus with pair of short and stout lateral sclerites, not strongly curved, abruptly narrowed before caudal point, distinctly dilated laterally, each forming semicircular lobe, with very slender basal roots; paramere

as long as style, turned twice, first at basal two-fifths and second at apical one-fifth, apical curve distinct, apical one-fifth sharply pointed and each with minute hyaline but distinct spot along caudal side of preapical part, basal sclerite irregularly subtriangular and its lateral lobe slightly larger than mesal; basal apodeme stout and V-shape, tips of two arms ending within base of coxite.

*Female*: Body length about 1.83 mm. Wing about 1.15 mm. by 0.41 mm. Coloration as in male, almost uniformly pale brown, yellowish pale brown or pale brownish white.

Head with eyes narrowly separated above, proboscis shorter than half height of head capsule (13.8:29.4). Mandibles slender and with seven teeth as in other members of group. Maxillary palp with five segments in proportion of 6:13.6:17.8:9.1:15.6. Antenna brownish, with distal eight segments in relative length of 14.1:15.7:16.2:36.3:40:40.4:40.9:60.6 and AR 1.76 (1.7-1.8).

Thorax with three median and two lateral bristles on scutellum, leg segments, except for coxae and trochanters, in proportion of 136.4:132.8:68.8:33.2:14.2:13.2:26.8 in fore, 162.9:156:97.9:38:15.4:13.6:27.5 in middle, and 160.8:159:89.1:36.8:14.2:12.7:25.8 in hind leg; fore leg with tibial spur about 0.28 (0.26-0.33) as long as tarsal segment 1, hind leg with usually six and rarely five or seven bristles of tibial comb and TR about 2.421 (2.33-2.54).

Wing with anterior veins pale brownish hyaline, macrotrichia very sparsely spread along apical margins of cells  $R_s$  and  $M_1$ . Venation: Costa ending at basal 0.8 of wing length (77.6:96.4),  $R_s$  about 3.45 times as long as  $R_1$  (32.4:9.4), second radial cell about three times as long as first (23:7.4), relative length of  $R$ ,  $M$ , and stem of  $fMCu$  about 35.4:35.9:39.7,  $M_{3+4}$  about twice as long as  $Cu_1$  (27.2:13.2),  $fMCu$  under  $r-m$ , which is subequal to or slightly shorter than  $M_{1+2}$ .

Abdomen with three spermathecae, oval and with hyaline punctures; two dark-brown, large and unequal (1.4+22 by 15.6 units and 1.3+19.3 by 13.1 units) and one small (0.9+6 by 4.6 units) and yellowish pale brown, each with short neck part; number, punctures, color, and inequality of three spermathecae common for other members of *calcaris* group.

Holotype, male (US 64054), Kolonia, Yap, Yap Is., July-Aug. 1950, Goss. Allotype, female (US), with holotype. Paratypes:

Palau. Seven males, female, East Ngatpang, Babelthuap, light trap, Dec. 8-10, 1952, Gressitt; female, Iwang, Babelthuap, Dec. 19, 1952, Gressitt; male, six females, Koror, light trap, Dec. 5, 14, 1952, Gressitt; male, Ulebsehel, Jan. 13, 1948, Dybas; male, Ulebsehel, Sept. 1952, Krauss.

Yap. Two females, Yap, July-Aug. 1950, Goss; male (BISHOP), hill, Yap, light trap, Nov. 29, 1952, Gressitt; female, Yap, Dec. 28, 1952, Gressitt; female, Mt. Tabiwol, Yap, 150 m., Nov. 29, 1952, Gressitt.

Ponape. Female, Mt. Nahnalaud, 300 m., beating vegetation, Mar. 18, 1948, Dybas; two males, female, Colonia, Agric. Exper. Sta., light trap, Jan. 7, 1953, Gressitt.

#### Other specimens:

Palau. Two females, Ngerehelong Pen., Babelthuap, May 6-8, 1957, Sabrosky; two males, Ulimang, Babelthuap, Dec. 10, 1947, Dybas; six males, Ngiwal, Babelthuap, May 20-21, 1957, Sabrosky; seven females, 11 males, Ngaremlengui, Babelthuap, light trap, May 6-8, 1957, Sabrosky; female, East Ngatpang, Babelthuap, Dec. 10, 1952, Gressitt; two females, 14 males, Koror, Apr. 27, May 30, 1957, Sabrosky.

Yap. Male, North Yap I., July 16, 1950, Adams; female, male, Dugor, Jan. 6, 1957, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau, Yap, Ponape).

122. *Stilobezzia* (*Neostilobezzia*) *tenuiforceps* Tokunaga and Murachi, n. sp.  
(fig. 87, g-m).

Minute, brownish, very closely related to, and almost indistinguishable from *S. calcaris*, except for characteristic male hypopygium.

*Male*: Body length about 1.9 mm. Wing about 1.17 mm. (1.03-1.21 mm.) by 0.38 mm.

Head pale brown, with vertex brown, mouthparts pale brown. Eyes separated above as wide as half a facet. Maxillary palp with segments in proportion of 5:12:16:9.5:8.5. Antenna with scape brown, short basal flagellar segments and plumose hairs very pale brown, four distal segments brown; segments 2 to 9, 2 to 10, 2 to 11, 10 to 14, 11 to 14, and 12 to 14 in proportion of 121.8:134.3:147.6:257.8:245.3:232; seven distal segments in proportion of 11:11:11:13:31:48:77.

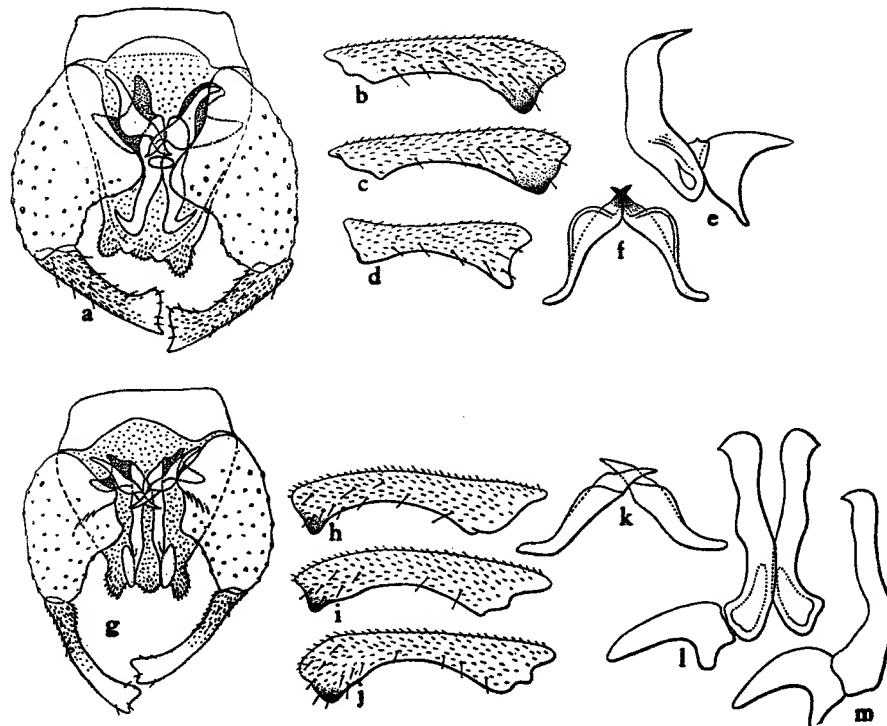


FIGURE 87.—a-f, *Stilobezzia* (*Neostilobezzia*) *calcaris*, male: a, hypopygium; b, style of hypopygium of typical case; c, style of some paratypes without concave apical margin; d, style of rare case with fishtail-like apical part; e, left half of parameres; f, aedeagus. g-m, *S. (Neostilobezzia) tenuiforceps*, male: g, hypopygium; h, style of hypopygium with slightly broad end; i, style of typical case; j, style of rare case with subsquare broad tip; k, aedeagus; l, parameres of typical case (one basal sclerite omitted); m, right half of parameres with more acute point.

Thorax, in dry state, entirely reddish brown and, in mounted specimen, uniformly pale brown; scutellum usually with five setae, rarely four or six. Legs pale yellowish brown; fore tibial spurs long and brown, 0.357 (0.319-0.397) as long as tarsal segment 1 differing from short yellow hind tibial spurs; in fore and hind legs, two basal segments each with one apical tarsal spur and 3 with two apical spurs and, in middle leg, segment 1 with one sub-basal and two apical spurs and following two segments each with two apical spurs, tibial comb of hind leg with six bristles and rarely five; leg segments, except coxae and trochanters, in proportion of 32:29.5:15.5:8:3.5:3:4 in fore leg, 37:35:21:9:3.8:3:4 in middle leg, and 37:36:18:9:4:3:5 in hind leg; hind TR 2.066 (2.024-2.103).

Wing almost entirely hyaline including veins, with several macrotrichia on R and distal one-fourth of  $M_1$ , ten or more along distal margin of cell  $R_5$  in two lines, and several along distal margin of  $M_1$  in a line. Venation:  $R_1$  ending above tip of  $Cu_1$ ,  $R_s$  ending beyond tip of  $M_{3+4}$ , second radial cell about six times as long as first cell (87:14), fMCu under origin of r-m,  $M_{1+2}$  longer than r-m and subequal to, or shorter than, first radial cell. Haltere pale brown.

Abdomen, in dry state, reddish brown and, in mounted specimen, uniformly pale brown. Hypopygium slightly more brownish than abdominal tergites; tergite 9 subtriangular, as long as basal width and round at caudal margin; sternite 9 very short, with broad but very shallow V-shape caudal incision; coxite swollen on basal part and slightly longer than tergite 9 and parameres; style almost as long as coxite, almost uniform in width or little broadened apically and very rarely broadened and subsquare, with apical two angles not pointed and apical edge not distinctly emarginate, but almost straight or very little concave. Aedeagus with pair of lateral sclerotized plates, almost straight and sharply pointed at tip, with very slightly developed lateral lobes; lateral sclerites of aedeagus with lateral lamellae very slightly developed or indistinct; parameres as long as or little longer than styles, each distal one-third curved ventrad and dilated into round fan-like lamella, highly specific in shape on apical point, differing from other members of *calcaris* group, each apical margin round and with very short minute point on sternal side slightly before apical round extremity and sometimes this apical point sharper and more acute, basal sclerite of each paramere elongate and rather slender; basal apodemes of parameres small, each with larger lateral arm ending within base of coxite and very small cephalic arm ending near base of lateral plate of aedeagus.

*Female*: Body about 1.35 mm. Wing about 1.06 mm. by 0.38 mm. Coloration similar to that of male.

Head with eyes separated above by less than a facet, clypeus with pair of apical setae and two or three lateral setae on either side, proboscis shorter than half height of head capsule (11.3:24). Maxillary palp with five segments in proportion of 5.3:12:15.3:8.5:12.3. Antenna with distal eight segments in proportion of 17.7:13.2:14.2:29.7:31.7:32:32.2:52.8, AR 1.63 (1.5-1.74).

Thorax with two median and two lateral bristles on scutum and a minute middle seta. Leg segments, except for basal two, about 119.8:115.3:60.7:28.3:12.7:11:23.3 in fore, 143.3:135:86.3:34:15:12:25 in middle, and 140.7:137.7:75:30.7:12:10.3:22.7 in hind leg; tibial spur of fore leg about 0.276 (0.266-0.302) as long as tarsal segment 1, hind leg with TR 2.42 (2.33-2.47) and five or six bristles of tibial comb.

Wing with main anterior veins very pale brown or pale brownish white, macrotrichia spread very sparsely along apical margins of cells  $R_5$  and  $M_1$  as in other members of the group. Venation: Costa extending at basal 0.79 of wing length (64.9:82.6),  $R_s$  about four times as long as  $R_1$  (27.8:7), second radial cell about three times as long as first cell (19.8:6.5), relative length of R, M, and stem of fMCu about 29.8:30:33.4,  $M_{3+4}$  little longer than twice of  $Cu_1$  (23:10.3), fMCu under r-m, subequal to  $M_{1+2}$ .

Abdomen with three spermathecae in proportion of 2+23.3 by 14.8 units, 1.8+19.2 by 13.7 units and 0.5+5.7 by 4.7 units.

Holotype, male (US 64055), southwest Koror, Palau, light trap, Dec. 1952, Gressitt. Allotype, female (US), southwest Koror, Palau, Dec. 5, 1952,

Gressitt. Paratypes, Palau: Two males, Ulimang, Babelthuap, Dec. 16, 1947, Dybas; male, Ngaremlengui, Babelthuap, May 6-8, 1957, Sabrosky; two males, June 3, female, June 30, 1957, Ngaremlengui, Babelthuap, Sabrosky; male, Airai, Babelthuap, May 26, 1957, Sabrosky; male (BISHOP), north-west Koror, 40 m., on limestone ridge, Dec. 14, 1952, Gressitt; female, three males, Apr. 27, male, Apr. 29, female, two males, May 30, 1957, Koror, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau).

This species is closely related to *S. calcaris*, but in the related species the styles and parameres are quite different in shape. The species name refers to the slender styles of the male hypopygium.

**123. *Stilobezzia* (*Neostilobezzia*) *latiforceps* Tokunaga, n. sp. (fig. 88, a-h).**

Medium-sized or rather large and pale-brown or pale-brownish yellow. Coloration and general structure closely similar to *S. calcaris*. Differences mainly shown in structure of the male hypopygium and development of tibial spurs of male fore legs.

*Male*: Body about 1.69 mm. varying from 1.48 mm. to 2.15 mm. Wing about 1.19 mm. by 0.34 mm., varying from 1.14 mm. by 0.35 mm. to 1.27 mm. by 0.4 mm.

Head mainly pale brown, with eyes separated above as wide as a facet, proboscis about 0.4 as long as height of head capsule (10.4:25.2), clypeus with two or three lateral setae on either side and pair of apical setae. Maxillary palp slender, without distinct sensory pores but with group of sensillae on preapical part of segment 3 and five segments in proportion of 5.6:11.3:17.4:8.6:14.7. Antenna with scape yellowish brown, short basal segments and plumose hairs yellow and apical three segments brown; segments 2 to 11 and 12 to 14 combined about 153.4:177; segment 11 as long as preceding short flagellar segments, ultimate segment with stylet distinct; relative length of apical eight segments about 12.7:12.9:12.6:12.3:13.5:34.8:51.7:86.9.

Thorax mainly yellowish pale brown to yellowish white, scutum with anterior marginal area more brownish and sometimes with a faint, ill-defined, more brownish, short vitta on anterior part; postscutellum pale brown; scutellum with five bristles. Legs very pale brownish yellow or slightly yellowish white, with knee joints yellowish brown; fore leg with large dark-brown apical spur about 0.429 (0.387-0.476) as long as tarsal segment 1; hind TR about 2.217 (2.15-2.324); leg segments, except for basal two, about 140.5:128.3:61.7:31.8:14.5:12.3:20 in fore, 159.3:145.7:93.7:36.7:15.7:11.8:19 in middle, and 157.5:147.8:77.6:35.4:15.1:11.8:20.8 in hind leg in proportional length. Tarsal spurs: in fore leg, basal three segments each with apical, in middle leg, first with sub-basal and two apical and following two each with two apical spurs, and in hind leg, basal three each with two apical spurs.

Wing with main veins very pale brown, macrotrichia very sparsely arranged closely along apical margins of cells  $R_5$  and  $M_1$ . Venation: Costa ending at basal 0.78 of wing length (70.8:90.5) and more or less beyond level of tip of  $M_{3+4}$ ,  $R_5$  about four times as long as  $R_1$  (28.2:7.4), second radial cell about three times as long as first (19.5:6.3), relative length of  $R$ ,  $M$ , and stem of  $fMCu$  about 33.8:33.9:38.9,  $r-m$  as long as or little longer than  $M_{1+2}$ ,  $fMCu$  under or little beyond origin of  $r-m$ ,  $M_{3+4}$  about 2.5 times as long as  $Cu_1$  (23.8:9.5). Haltere entirely yellow or pale brown.

Abdomen very pale brown or yellowish white; hypopygium mainly yellowish brown, but parameres and lateral sclerites of aedeagus brown; sternite 9 with caudal emargination very widely and shallowly triangular and caudal membrane spinulose; tergite 9 rather long, tapered and with anal points vestigial; coxites conical, about twice as long as basal width (45.3:28.2), with basal swelling and extending caudad as long as tergite; styles distinctly shorter than coxites (38.5:45.3), almost straight, slightly narrowed on middle part and distinctly broadened apically, apical width about one-third of total length (12.4:

38.5) and about 2.5 times as wide as middle narrowest part (12.4:4.9), apical part more or less fishtail-like, but lateral angle more produced and pointed than mesal angle, but rarely two apical angles similarly pointed, round or obtuse; aedeagus with lateral sclerites sharply pointed and with lateral expansion small; parameres about 1.5 times as long as lateral sclerites of aedeagus (35.7:23.3), slightly undulate, apical one-fifth strongly curved with right angle, very sharply pointed at apices and without hyaline spots along edges of apical part differing from those of *S. calcaris*; basal sclerite of parameres rather broad.

*Female*: Body about 1.94 mm. long, varying from 1.77 mm. to 2.15 mm. Wing about 1.39 mm. by 0.48 mm. Coloration similar to that of male.

Head with eyes narrowly separated above by less than a facet, clypeus with two apical setae and two or three lateral setae on either side, proboscis about half as long as length of head capsule (14.4:30.4). Maxillary palp with five segments about 6.5:15.2:19.1:9.4:16 in relative length. Antenna with distal eight segments in proportion of 15.7:17.8:17.8:40.4:41.1:41:38.5:57.1 and AR 1.56 (1.38-1.74).

Thorax yellowish pale brown to brown; scutellum with five bristles. Legs with segments, except for basal two, in proportion of 153.2:148.6:74.6:34.2:14.6:14.2:30 in fore, 180.4:175.4:106.8:49.6:16.9:14.9:30.6 in middle; and 180:180.2:94.2:38.1:15:12.9:29.4 in hind leg; fore leg with apical tibial spur 0.29 (0.26-0.33) as long as tarsal segment 1; hind leg with five to seven bristles of apical tibial comb and TR 2.47 (2.36-2.55).

Wing with main anterior veins pale brown and macrotrichia sparsely spread along apical margins of cells  $R_s$  and  $M_1$ . Venation: Costa extending to basal 0.8 of wing length,  $R_s$  about 3.4 times as long as  $R_1$  (35.2:10.4), second radial cell about three times as long as first (25.7:8.4),  $R$ ,  $M$ , and stem of fMCu in proportion of 40:40:44.3,  $M_{1+2}$  little longer than twice of  $Cu_1$  (31:14), fMCu under r-m which is subequal to or slightly shorter or longer than  $M_{1+2}$ . Haltere with stem yellowish white and knob pale brown to brown.

Abdomen with tergites pale brown or yellowish brown, sternites white, except for brownish penultimate sternite, cerci pale brown; three spermathecae, oval, unequal, larger two, brown and smallest one, yellow, their length and width about 1.8+23.3 by 15.8 units, 1.4+19.4 by 14 units and 0.5+5.9 by 4.6 units.

Holotype, male (US 64616), Imeliik, Babelthuap I., Palau Is., light trap, June 6, 1957, Sabrosky. Allotype, female (US), Ngaremlengui, Babelthuap I., Palau Is., June 3, 1957, Sabrosky. Paratypes, Palau: male (BISHOP), Ngarehelong Pen., Babelthuap I., May 6-8, 1957, Sabrosky; two males, Ulimang, Babelthuap I., Dec. 19, 1947, Dybas; three females, two males, June 1-3, 30, 1957, Sabrosky; two males, Melekeiok, Babelthuap I., May 24, 1957, Sabrosky; five males, East Ngatpang, Babelthuap I., light trap, Dec. 9-10, 1952, Gressitt; two males, Airai, Babelthuap I., May 16, 26, 1957, Sabrosky; female, Koror I., Sept. 16, 1952, Beardsley, female, three males, May 30, 1957, Sabrosky. Yap: Female, Kolonia, Yap I., July-Aug. 1950, Goss; female, Mt. Tabiwol, Yap I., Oct. 29, 1952, Gressitt.

DISTRIBUTION: Caroline Is. (Palau, Yap).

#### 124. *Stilobezzia* (*Neostilobezzia*) *latiforceps setigera* Tokunaga, n. subsp.

A large fuscous pale-brown subspecies of *S. latiforceps*. The distinct differences from the type are as follows: Body far larger, scutellum setigerous with nine bristles, general color fuscous, middle and hind coxae distinctly more fuscous than fore coxae. Hypopygium is quite similar to that of type except for larger structure.

*Male*: Body about 2.43 mm. long. Wing about 1.71 mm. by 0.53 mm. Color almost uniformly fuscous pale brown and general structure closely as in type.

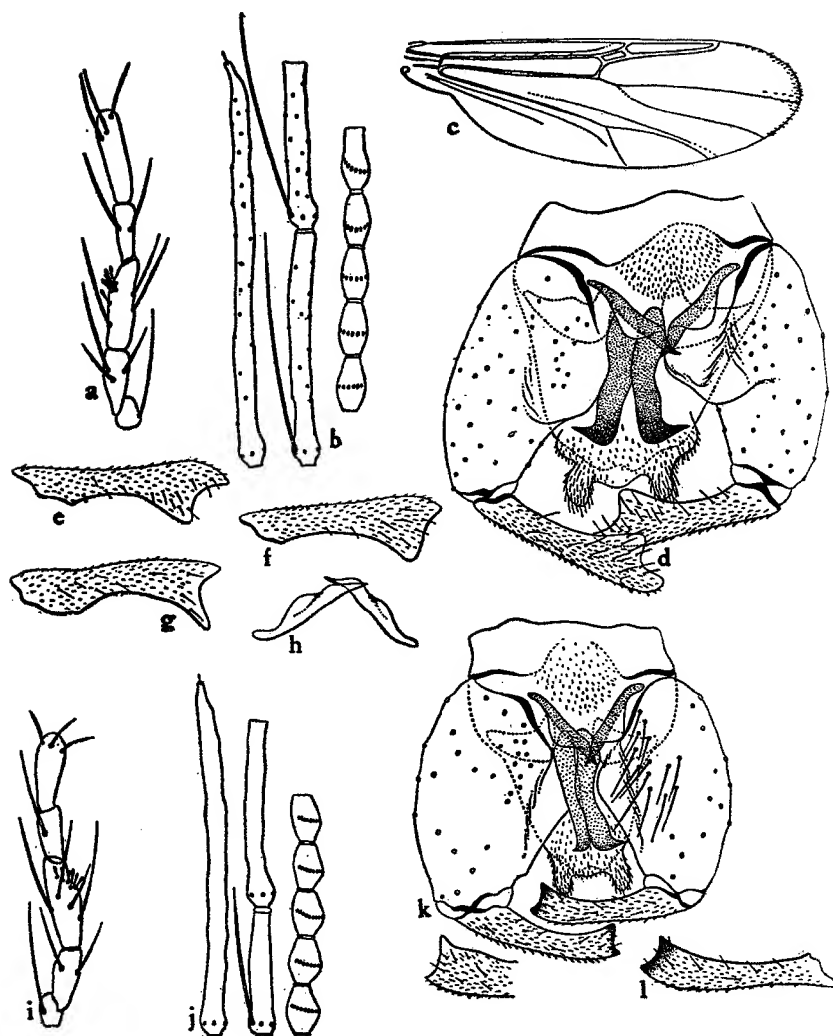


FIGURE 88.—a-h, *Stilobezzia* (*Neostilobezzia*) *latiforceps*, male: a, maxillary palp; b, distal eight antennal segments; c, wing; d, hypopygium; e, style of hypopygium of typical case; f, style of rare case with two obtuse corners; g, style of rare case with two sharply pointed corners; h, aedeagus. i-l, *S.* (*Neostilobezzia*) *truncata*, male; i, maxillary palp; j, distal eight antennal segments; k, hypopygium with enlarged tip of style; l, style of paratype.



Head yellowish brown, with vertex brown, mouthparts fuscous pale brown, eyes very narrowly separated above by less than a facet, proboscis little shorter than half length of head capsule (15:34). Maxillary palp slender, fuscous, each with group of sensillae beyond middle of segment 3, without sensory pore, five segments about 7:16:23:13:20 in proportional length. Antenna with scape fuscous yellowish brown, all other segments and plumose hairs brown; relative combined length of segments 2 to 11 and 12 to 14 together about 177:279; proportional length of distal eight segments about 14:15:15:16:17.5:50:80:145.

Thorax almost entirely yellowish brown; scutellum with nine bristles arranged in a line. Legs mainly pale yellowish, with middle and hind coxae fuscous; fore femur with four strong bristles on apical end, fore tibia with strong, dark, curved apical spur about 0.41 as long as tarsal segment 1; hind tibia with seven bristles in apical comb; hind TR about 2.17. Tarsal spurs: In fore leg, first two segments with single apical and 3 with two apical, in middle leg, 1 with sub-basal and two apical and segments 2 to 3 each with two apical, in hind leg, 1 with single apical and 2 to 3 with two apical. Leg segments, except for basal two, about 200:192:94:49:20:17:37 in fore, 227:207:129:58:22:16:32 in middle, and 227:216:115:53:19:15:35 in hind leg in relative length.

Wing with anterior veins fuscous pale brown, macrotrichia spread only along apical margins of cells  $R_4$  and  $M_1$ . Venation: Costa ending at basal 0.8 of wing length (109:138),  $R_s$  slightly shorter than four times of  $R_1$  (40:11), second radial cell about three times as long as first (29:9), relative length of  $R$ ,  $M$ , and stem of  $fMCu$  about 57:59:60,  $M_{3+4}$  about 2.6 times as long as  $Cu_1$ ,  $fMCu$  under end of  $r-m$ ,  $r-m$  very little shorter than  $M_{1+2}$ . Haltere with stem yellowish pale brown and knob fuscous pale brown.

Abdomen brownish, but sternites far paler, Hypopygium also brown; tergite 9 tapered, sternite 9 arcuate, transverse, with caudal emargination very wide and shallow, caudal membrane entirely spinulose; coxites conical, about 1.5 times as long as basal width (70:45) and extending caudad as far as caudal end of tergite; styles about 0.8 as long as coxites (54:70), very slightly arcuate, gradually flattened and somewhat fishtail-like at tips; aedeagal sclerites very slightly sinuate and with lateral lamellae slightly developed; parameres as long as styles, little curved before middle and with tips short, strongly curved and sharply pointed, basal sclerite somewhat triangular, rather long transversely and little shorter than 1.4 times of mesal side.

Holotype, male (US 64617), Koror I., Palau Is., Apr. 27, 1957, Sabrosky.  
DISTRIBUTION: Caroline Is. (Palau Is.).

**125. *Stilobezzia* (*Neostilobezzia*) *truncata* Tokunaga, n. sp. (fig. 88, i-l).**

Medium-size pale-brownish yellow. Male hypopygium closely similar to *S. tenuiforceps* and tibial spurs of male fore legs well developed as in *S. latiforceps*.

*Male*: Body about 1.43 mm. to 1.57 mm. Wing about 1.12 mm. by 0.39 mm. to 1.25 mm. by 0.49 mm. Coloration almost uniformly pale brownish yellow.

Head with eyes separated above as wide as 0.7 of a facet, proboscis about 0.4 as long as length of head capsule (11:25.5), clypeus with two lateral on either side and pair of apical small setae. Maxillary palp pale brown, each with rather loose group of sensillae on preapical part of segment 3 and without sensory pore, with five segments in proportion of 6:11.5:16:9:16.5. Antenna with scape yellowish brown, short basal flagellar segments and plumose hairs pale brownish yellow, apical three segments pale brown; combined relative length of segments 2 to 11 and 12 to 14 about 140.5:163; relative length of distal eight segments 12:12.3:12.3:12.3:13.3:33:49.5:80.

Thorax entirely pale brown, but anterior margin of scutum very faintly fuscous; scutellum with three median and two lateral bristles. Legs entirely pale brown or pale brownish yellow, but articulations of segments more brownish; fore leg with large, dark, apical spur of tibia 0.4 to 0.46 as long as tarsal segment 1, apical tibial comb of hind leg with five or six bristles. Tarsal spurs: In fore and hind legs basal two segments each with one apical and in middle leg 1 with a sub-basal and two apical and segment 2 with

two apical; hind TR about 2.21 (2.19-2.23); relative length of apical seven leg segments about 139.5:130.5:60:31.5:13.5:10.5:17.5 in fore, 156.5:142.5:89:35.5:14.5:11:18 in middle, and 152.5:143.5:73:33:13.5:10:20 in hind leg.

Wing normal, very pale brownish hyaline including veins, macrotrichia very sparsely arranged closely along apical wing margin between tips of  $R_s$  and  $M_s$ . Venation: Costa ending above tip of  $M_{s+4}$  and extending about basal 0.78 of wing length (72.5:92.5),  $R_s$  about 3.5 times as long as  $R_1$  (28:8), second radial cell about three times as long as first cell (20:6.8), r-m as long as  $M_{1+2}$ , fMCu under r-m, relative length of R, M, and stem of fMCu about 36.5:37:39.5,  $M_{s+4}$  about 2.4 times as long as  $Cu_1$  (26.5:11). Haltere entirely pale brownish white.

Abdomen mainly pale brown including hypopygium and slightly more brownish than thorax, tergites and sternites highly reduced. Hypopygium not darker or more brownish than other parts of abdomen, with aedeagus, parameres, and apices of styles brown; sternite 9 with caudal emargination very wide and subtriangular and caudal membrane finely spinulose; tergite 9 distinctly tapered and anal points highly reduced; coxites conical, basally swollen, and setigerous, not longer than twice basal width (51.5:32.5) and extending caudad as far as tergite; styles much shorter than coxites (37.5:51.5), very slightly broadened apically, apical width only 1.4 times narrowest part (7:5), apical end truncate and slightly concave, and two apical corners pointed and equal or subequal in size; aedeagus with two lateral sclerites about 0.64 as long as styles (23:36), sharply pointed at caudal apices, and with lateral lamellae rather well developed and semicircular; parameres slightly shorter than or subequal to styles, with apical tips strongly curved ventrad, sharply pointed and rather long, basal sclerite of paramere somewhat triangular, rather broad, and not longer than twice of width.

*Female:* Body about 1.73 (1.56-1.79) mm. long. Wing about 1.13 mm. by 0.43 mm. Coloration as in male.

Head with eyes very narrowly separated above, clypeus with six or seven setae, but very rarely with one or two minute additional setae, proboscis about half as long as height of head capsule (14.3:30). Maxillary palp with five segments in proportion of 6.2:14:18.8:9.4:16.4. Antenna with distal eight segments about 15.1:17.3:18.1:37.7:38.8:39.3:39.9:58.8 in relative length, AR about 1.54, varying from 1.44 to 1.68.

Thorax uniformly pale or yellowish brown, scutellum usually with three median and two lateral bristles, but sometimes with two or four median and two lateral and rarely central bristles more or less reduced and very rarely with one or two minute additional setae. Leg segments, except for basal two, in proportion of 147.4:142.4:69.8:34.2:14.8:13.8:29.2 in fore, 170.2:164.8:100.6:40.6:16.6:14.2:29.6 in middle, and 171.4:168:90.5:37.3:15:13.6:27.8 in hind leg; fore leg with apical tibial spur about 0.28 (0.25-0.33) as long as tarsal segment 1; apical tibial comb of hind leg with five or six bristles and hind TR about 2.436 (2.24-2.657).

Wing with anterior veins pale brown, macrotrichia sparsely spread along distal margins of cells  $R_s$  and  $M_s$ . Venation: Costa extending at basal 0.8 of wing length (81.4:101.3),  $R_s$  about 3.5 times as long as  $R_1$  (34.6:10), second radial cell about three times as long as first (25.4:8), relative length of R, M, and stem of fMCu about 37.6:38:42.4,  $M_{s+4}$  little longer than 2.5 times of  $Cu_1$  (13.2:35.4), fMCu under r-m, r-m is subequal to or a very little longer than  $M_{1+2}$ . Haltere with stem pale brownish white and knob pale brown, yellowish pale brown or slightly pale brown.

Abdomen more brownish than thoracic tergites; three spermathecae, oval, unequal, with hyaline punctures and very short neck parts, larger two, brown and about 1.1+22.7 by 15.2 units and 1.2+17.2 by 12.8 units in proportion and smallest one, yellow and about 0.8+5.8 by 4.7 units.

Holotype, male (US 64618), Dugor, Yap I., light trap, Jan. 6, 1957, Sabrosky. Allotype, female (US), Ngaremlengui, Babelthuap I., Palau Is., June 1, 1957, Sabrosky. Paratypes, Palau: Six females, male (US), Ngaremlengui, Babelthuap I., May 6-8 and June 2, 3, 30, 1957, Sabrosky; five females

(BISHOP), Koror I., May 1953, Beardsley, Apr. 27 and May 3, 30, 1957, Sabrosky; female, Southwest Koror I., Dec. 11, 1952, Gressitt. Yap: Three females, Dugor, Yap I., light trap, May 14, 1957, Sabrosky; female, Kolonia, Yap I., June 21, 1957, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau, Yap).

126. *Stilobezzia longistyla* Tokunaga (fig. 89, *a, b*).

*Stilobezzia longistyla* Tokunaga, 1941, Annot. Zool. Japon. 20 (2): 117 (Truk).

Yellowish-brown to brown; scutum brown, legs yellowish pale brown, scutellum with four strong bristles and several small accessory setae, haltere and abdomen brown.

*Male*: Body length 1.3-1.5 mm. Wing about 1.0 mm. by 0.3 mm.

Head brown, with vertex dark brown, eyes just contiguous above; mouthparts brown; clypeus with five or six setae; five segments of maxillary palp in proportion of 4:6:12.5:8:10. Antenna with scape yellowish or orangeish brown, other segments and plumose hairs pale brown or brown; distal seven segments in proportion of 13:13:12.8:13.5:30.3:52:55; segments 2 to 10, 2 to 11, 11 to 14, and 12 to 14 in proportion of 107:119:141:129.

Thorax almost uniformly brown; scutellum somewhat slightly paler and with four strong bristles and five small accessory setae. Legs yellowish pale brown or pale brown, but apical one-third of all femora and entire length of all tibiae somewhat more brownish; proportion of femur, tibia, and three basal tarsal segments of fore leg about 110:107:58:21:11, those of femur, tibia, and four basal tarsal segments of middle leg about 127:124:74:21:10:9.5 and those of femur, tibia, and two basal tarsal segments of hind leg about 114:119:50:27. Three basal segments of fore tarsus each with apical tarsal spur, those of middle tarsus each with two apical spurs; segment 1 of fore tarsus with sub-basal spur and segment 1 of hind tarsus without spur and following two each with apical spur; tarsal segments 5 all without conspicuous spur.

Wing with membrane pale brown, veins somewhat more brownish; macrotrichia on veins practically absent; those of membrane very sparsely arranged, several setae very closely along fringe of cell  $R_s$  and few setae, also very closely, along fringe of cell  $M_1$ . Venation:  $R_1$  ending just beyond level of tip of  $Cu_1$ ,  $R_s$  ending just beyond tip of  $M_{3+4}$  and at about basal four-fifths of wing (59:77),  $rMCu$  under  $r-m$ , first radial cell about one-third of second cell (6:17),  $R_s$  longer than three times of  $R_1$  (24:7),  $r-m$  shorter than  $M_{1+2}$  (3:5). Haltere brown.

Abdomen brown. Hypopygium brown, with parameres, apodemes, and lateral sclerites of aedeagus dark brown; tergite 9 broad and somewhat semicircular; sternite 9 transverse, very short, its caudal margin broadly concave and caudal membrane entirely spinulose; coxite rather short and almost as long as basal width in ventral aspect; style stout, tapered, evenly and slightly arcuate, pointed at tip, and fully as long as coxite. Aedeagus somewhat triangular, its lateral sclerites slender, slightly curved, without distinct lateral expansion, apical membranous lobes blunt; parameres very long, slender, basal two-fifths strongly thickened and fusiform, each apical slender part curved ventrad and ending in sharp point; basal apodemes of parameres rather slender and Y-shape.

*Female*: Body length 1.7 (1.54-1.86) mm. Wing 1.17 (1.1-1.22) mm. by 0.45 (0.44-0.47) mm. Coloration generally as in male.

Head with eyes just separated above; clypeus with six to eight setae; maxillary palpal segments in proportion of 4.7:9.5:16:8:14.2. Antenna with scape brown, other segments also uniformly brown or slightly paler than scape; AR 1.15-1.17; distal eight segments in proportion of 16.5:17:17.5:30.3:31.7:31.8:32.5:41.7.

Thorax with tergal side uniformly brown; scutellum with four strong bristles and five to eight small accessory setae. Legs with coxae and trochanters yellowish pale brown, other segments mainly pale yellowish brown and slightly more brownish, apical one-third of all femora and apical tips of middle and hind tibiae more brownish; proportion

of leg segments about 130:122:67:25:12.2:15.3:26.5 in fore leg, 151.7:144:84.7:29:11:12:19.7 in middle leg, and 145.7:150.7:76:14.7:12:12.3:25.3 in hind leg. Two basal segments of fore and hind legs each with apical tarsal spur and segment 3 of these legs each with two apical spurs, but, in one specimen, segment 3 of hind leg with only apical spur; in middle leg, three basal tarsal segments each with two apical spurs and tarsal segment 1 with three additional spurs on basal half.

Wing with veins brown, membrane pale brown, macrotrichia of veins found on R, distal section of Rs, distal one-fifth to one-third of M<sub>1</sub>, and at tip of M<sub>2</sub>, those of membrane sparsely distributed on apical areas of cells R<sub>5</sub> and M<sub>1</sub> and a few trichia arranged very closely along fringe of cells M<sub>2</sub> and M<sub>4</sub>. Venation: End of R<sub>1</sub> slightly beyond level of end of Cu<sub>1</sub>, Rs ending just beyond or before middle point between tips of M<sub>2</sub> and M<sub>3+4</sub> and ending at basal five-sixths of wing (76:95), first radial cell shorter than one-half of second cell (9.3:22.5), Rs about three times as long as R<sub>1</sub> (34:11), r-m much shorter than M<sub>1+2</sub> (4:5.8), fMCu about under r-m. Haltere brown.

Abdomen uniformly brown; two spermathecae, oval, brown, subequal (18 by 13 units and 17 by 12 units); one small (4.5 by 4.0 units), brown, subspherical; all thecae without chitinized ducts.

DISTRIBUTION: Eastern Caroline Is.

Allotype, Mt. Unibot, 32 m., light trap, Jan. 1953, Gressitt.

TRUK. WENA: Mt. Chukumong, male, female, light trap, Dec. 1952, Gressitt. TON: Female, same data as for allotype.

This species is known only from Truk and, hitherto, two males and three females have been collected. The most distinct characters of this species are the brown thoracic tergal side and paler legs, the setigerous scutellum with two pairs of strong bristles and several small accessory setae, the brown halteres, the very sparse macrotrichia of the wings, the slender parameres of the male hypopygium, and the peculiarly spurred basitarsi of female middle legs with two additional spurs beside a sub-basal one on the basal half. The original description may be corrected and supplemented with the above description.

#### 127. *Stilobezzia fusistylata* Tokunaga and Murachi, n. sp. (fig. 89, c).

Small, yellowish; thorax, legs, and abdomen yellowish brown to pale brown, but fore coxa and trochanter more brownish than in other legs; scutellum with at least three pairs of strong bristles and several shorter accessory setae.

*Male*: Body length 2.4-2.54 mm. Wing 1.54-1.85 mm. by 0.5-0.55 mm.

Head including mouthparts pale brown to pale yellowish brown, but vertex brown. Eyes separated above as wide as a facet. Maxillary palp with segments in proportion of 6.5:13.5:19.5:10.5:20.3. Antenna with scape, short flagellar segments, and plumose hairs yellow to pale yellowish brown, elongate distal segments brown; distal seven in proportion of 12.8:13.5:13.5:14:40.5:63.5:100.5.

Thorax entirely yellow to very pale yellowish brown; scutellum with four pairs of strong setae and three small accessory setae. Legs almost entirely yellow to pale yellowish brown, but fore coxa and trochanter somewhat brownish; fore tibia with small, yellow, straight apical spur. Leg segments in proportion of 40.5:39:18.8:11:4.3:3.8:6.3 in fore leg, 48:43:24.5:12.5:4.3:3.8:5.8 in middle leg, and 46.5:46.5:23.3:12:4.3:3.8:7.5 in hind leg. In fore leg, two basal segments each with apical tarsal spur and 3 with two distinct apical spurs; in middle leg, three basal segments each with two apical spurs and segment 1 with sub-basal additional spur; in hind leg, segment 1 with one spur and following two each with two distinct apical spurs.

Wing hyaline, with anterior veins pale yellow to very pale brown; macrotrichia very sparse, four on R, several on distal part of M<sub>1</sub>, 12 to 17 in line along distal margin of cell

$R_s$ , several in line above distal part of  $M_1$  and several along anterior part of distal margin of cell  $M_2$ . Venation:  $R_1$  ending above or just before tip of  $Cu_1$ ,  $R_s$  ending above or just before tip of  $M_{3+4}$ , fMCu under r-m,  $M_{1+2}$  subequal to first radial cell and longer than r-m, second radial cell 3.4 times as long as first cell. Haltere pale yellow or white.

Abdomen pale yellowish brown and four basal tergites pale yellow or very pale yellowish brown. Hypopygium yellowish brown; tergite 9 rather long and rounded caudad; sternite 9 rather broad, shallowly concave, and small mesal blunt projection of caudal margin; coxite broad, slightly longer than basal width; style short, somewhat fusiform, and dark at pointed tip; lateral plates of aedeagus very slender, each with pointed tip curved just before tip; parameres very small, much shorter than lateral plates of aedeagus, slightly curved ventrad before terminal, round thin lamellae; basal apodemes far larger than parameres, somewhat elongate, and triangular.

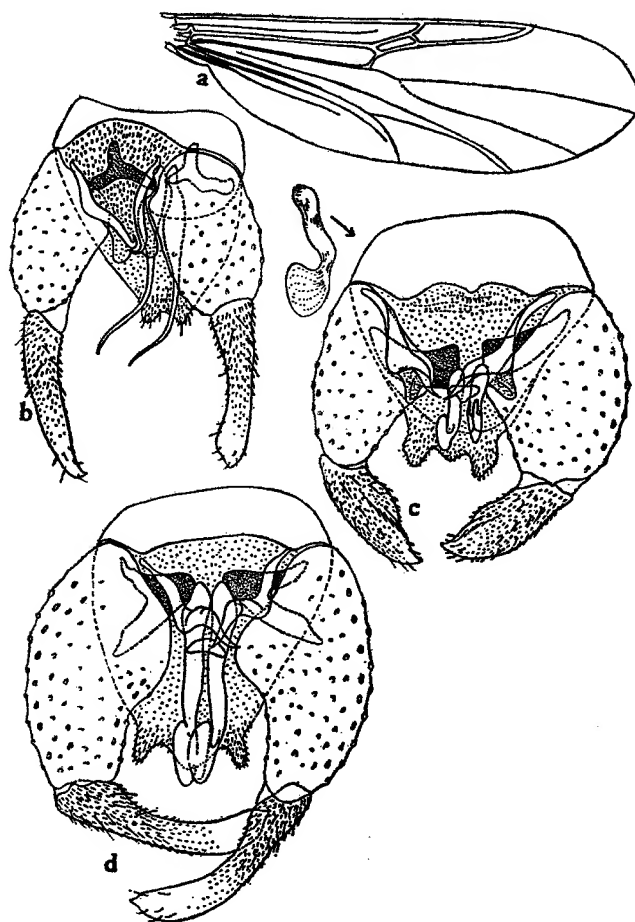


FIGURE 89.—a, b, *Stilobezzia longistyla*, male: a, wing; b, hypopygium. c, *S. fusi-stylata*, male hypopygium and paramere. d, *S. setigeriscutellata*, male hypopygium.

**Female:** Body about 2.11-2.81 mm. long. Wing about 1.22-1.54 mm. by 0.43-0.56 mm. Coloration and general structure closely as in male with usual sexual differences.

Head brown, with mouthparts pale brown, vertex brown; eyes separated above as wide as half a facet; maxillary palp with segments in proportion of 7.7:15.3:22.2:11:17.2. Antenna with scape yellow, short basal flagellar segments pale yellowish brown to pale brown, but brown at tips of several distal segments, five long distal segments brown, but pale yellow at each base; AR about 1.8 (1.7-1.9); proportion of eight distal segments about 4.1:4.9:5.1:12:12.1:12.5:12.1:17.2.

Thorax with scutum pale yellowish brown to pale orange brown, scutellum and postscutellum pale yellow to pale yellowish brown; scutellum with three pairs of strong bristles and four to six small accessory setae. Legs mainly pale yellow to pale yellowish brown, but fore coxa and trochanter brownish; leg segments in proportion of 36.8:36:17.1:8.8:3.9:3.4:7.5 in fore leg and 44:43.8:23.4:10.3:4.3:3.5:8 in hind leg.

Wing with anterior veins pale yellow to very pale brown. Venation:  $R_1$  ending above tip of  $Cu_1$ ,  $R_s$  ending beyond tip of  $M_{3+4}$ ,  $fMCu$  under  $r-m$ ,  $M_{1+2}$  subequal to  $r-m$ , or slightly longer, and subequal to first radial cell or slightly shorter, second radial cell about three times as long as first radial cell or slightly shorter (30.5:92). Macrotrichia on radial veins, distal one-third of  $M_1$ , distal half of  $M_2$  and distal one-fourth of  $M_{3+4}$ , and on membrane of distal one-fourth of cell  $R_s$ , along distal margins of cells  $M_1$  and  $M_2$ . Abdomen uniformly yellow to pale yellowish brown; two spermathecae brown, oval, unequal, and without chitinized ducts; one minute and hyaline.

Holotype, male (US 64056), Agric. Exper. Sta., Colonia, Ponape, light trap, Jan. 20, 1953, Gressitt. Allotype, female (US), same data as for holotype. Jan. 7, 1953, Gressitt. Paratypes:

Palau. Female, Ngatpang, Babelthuap, Dec. 10, 1952, light trap, Gressitt.

Yap. Male, Dugor, Jan. 6, 1957, light trap, Sabrosky.

Ponape. Female, Colonia, July 17, 1950, Adams; two males (BISHOP), Agric. Exper. Sta., Jan. 6, 1953, Gressitt; male, three females, same data as for allotype; two females, Agric. Exper. Sta., light trap, Jan. 11, 1953, Gressitt; female, same data as for holotype; male, female, Agric. Exper. Sta., June-Sept. 1950, Adams; male, two females, Nanpohnmal, light trap, Jan. 11, 1953, Gressitt; four males, four females, Mt. Temwetemwensekir, light trap, Jan. 18-19, 1953, Gressitt.

**DISTRIBUTION:** Caroline Is. (Palau, Yap, Ponape).

This species is closely allied to *S. subsoror* from Micronesia, but this species is larger, has more setigerous scutellum, brownish coxae and trochanters of fore legs, and specific fusiform styles of male hypopygium. The species name is related to the shape of styles of the male hypopygium.

### 128. *Stilobezzia setigeriscutellata* Tokunaga and Murachi, n. sp. (fig. 89, d).

Rather large, brown to yellowish-brown; scutum slightly shining and with four pairs or more of strong setae; legs pale brown; abdomen yellowish brown or brown; haltere pale yellowish brown or pale brown. Female tarsal segment 5 of all legs with pair of sub-basal ventral spurs.

**Male:** Body length 3.09-3.4 mm. Wing 1.86-2.0 mm. by 0.56-0.6 mm.

Head almost entirely brown; clypeus with at least four pairs of setae. Eyes separated above as wide as half a facet. Mouthparts brown, maxillary palp with segments in proportion of 7:16.5:27.5:15:19.3. Antenna with scape pale yellowish brown, short basal flagellar segments and plumose hairs pale brown and three longer distal segments brown;

flagellar segments 2 to 9, 2 to 10, 2 to 11, 10 to 14, 11 to 14, and 12 to 14 in proportion of 142.5:158:177:296:280.5:261.5; distal seven segments in proportion of 14.5:14.8:14:16.5:50.5:72.5:122.8.

Thorax, in dry state, brown and slightly shining and, in mounted specimen, yellowish brown to pale brown; scutellum pale brown to pale yellowish brown and with four pairs of long bristles and rarely with one or two accessory small setae. Legs uniformly pale brown or yellow, but coxae somewhat slightly more brownish than other segments. In fore leg, three basal tarsal segments each with two apical tarsal spurs, but rarely with one apical; in middle leg, basal three each with two apical spurs, but 1 with additional one on sub-basal part; in hind leg, segment 1 with one apical spur and 2 to 3 each with two apical spurs; tarsal segment 5 of all legs without distinct spurs or spines. Leg segments in proportion of 53:51.5:27.8:15.5:6:4.8:10.5 in fore leg, 64.5:57:36:18:6.5:5:10 in middle leg, and 64.5:65:33.5:16.3:6.3:4.8:11 in hind leg.

Wing very pale yellowish brown and hyaline, with veins pale brown. Four or five macrotrichia on vein R, two on  $R_1$ , four or five on  $R_s$ , five on tip of  $M_1$ , about 13 to 15 along distal margin of cell  $R_s$ , about seven in a line above tip of  $M_1$ , and six along anterior half of distal margin of cell  $M_s$ . Venation:  $R_1$  ending above or just beyond tip of  $Cu_1$ ,  $R_s$  ending beyond tip of  $M_{s+4}$ , second radial cell longer than three times of first cell (120:35), fMCu under origin of r-m,  $M_{1+2}$  longer than r-m and shorter than, or subequal to, first radial cell. Haltere pale yellow or pale yellowish brown.

Abdomen pale yellowish brown, rarely two posterior segments slightly more brownish. Hypopygium brown; tergite 9 paraboloid, slightly longer than basal width and round at caudal margin; sternite 9 with caudal margin very slightly arcuate and almost parallel to anterior margin; coxite very large, swollen on basal half, and extended caudad slightly beyond tip of tergite 9; style slightly arcuate, somewhat narrowed on middle part, clavate on distal part, and each ending in small, dark apical tooth. Aedeagus with pair of chitinized lateral plates, curved twice with angle about 90 degrees: distal half at first curved mesad and then distal one-fourth curved caudad, distal tip of each lateral plate sharply pointed, and lateral discoidal expansion absent; parameres orange yellow, very long, as long as tergite 9, distal part curved ventrad beyond middle and each ending in fan-like hyaline round lamella; basal apodemes of parameres large, V-shape, two arms of each apodeme subequal in size, extended laterad, and ending within base of coxite.

*Female*: Body length 2.0-3.4 mm. Wing about 1.5-1.81 mm. by 0.54-0.68 mm.

Head with eyes narrowly separated above as wide as half a facet. Maxillary palp with segments in proportion of 10:21:30:16:25. Antenna with scape yellowish pale brown, other segments pale brown; AR 1.7-1.72; eight distal flagellar segments in proportion of 5.5:6.5:7:14.5:14:15:14.5:22.

Thorax entirely yellowish pale brown, but in dry state yellowish brown; scutellum with nine strong bristles arranged in transverse line and pair of small accessory setae on lateral angles. Legs, in dry state, uniformly yellowish brown; but, in mounted specimen, coxae of legs yellowish brown, other segments yellow, but two distal tarsal segments of all legs somewhat brownish. Fore and hind tarsal segment 1 each with one apical tarsal spur and 2 to 3 each with two apical ones, middle segment 1 with sub-basal and two apical spurs and 2 to 3 each with two apical spurs; tarsal segment 5 each with two sub-basal ventral spurs or spines stronger than other setae of segment 5, but more slender than spurs of three basal tarsal segments, middle tarsal segment 5 with two additional ventral spurs at middle slightly more slender than sub-basal spurs of segment 5; claws single, each with long basal tooth, half as long as longer claw. Leg segments, except for basal two, in proportion of 52:50:27:14:5:5:13 in fore leg, 58:58:32.5:14:6.5:6:12 in middle leg, and 65:65:33:13.8:5:5:12 in hind leg.

Wing with anterior veins brown, membrane very pale brownish hyaline; setae present on veins R,  $R_1$ ,  $R_s$ , and distal parts of  $M_1$ ,  $M_s$ , and  $M_{s+4}$ ; macrotrichia of membrane sparsely distributed along distal margins of cells  $R_s$ ,  $M_1$ , and  $M_s$ . Venation:  $R_1$  ending before tip of  $Cu_1$ ,  $R_s$  ending much beyond tip of  $M_{s+4}$ , second radial cell longer than three times first cell (31.5:9), fMCu under end of r-m,  $M_{1+2}$  slightly longer than r-m and

slightly shorter than first radial cell. Haltere pale brown in dry state and yellow in mounted specimen.

Abdomen yellowish pale brown, with one large oblong white spot on base of dorsal side extending from tergites 1 to 3; two spermathecae equal, oval, brown, with many hyaline dots, with short chitinized duct, one spermatheca small, oval, pale brown, and with short duct.

Holotype, male (US 64057), Mt. Dolen Nankep, Ponape, Caroline Is., Aug. 11, 1946, Townes. Allotype, female (BISHOP 2763), Agric. Exper. Sta., Colonia, Ponape, light trap, Jan. 11, 1953, Gressitt. Paratypes, Ponape: Male, same data as for holotype; male, June-Sept. 1950, Adams; five females (BISHOP), Agric. Exper. Sta., Colonia, Jan. 6-11, 1953, Gressitt; female, south of Nanpohnmal, light trap by hill, Jan. 17, 1953, Gressitt.

DISTRIBUTION: Caroline Is. (Ponape).

This species is very closely related to *S. fusistylata*, but in *fusistylata* the male styles are different in shape and the female tarsal segment 5 has no ventral spurs or spines. Another allied species may be *S. spadicoxalis*, but the scutellum is less setigerous and the female tarsal segment 5 has no ventral spurs or spines, differing from this species.

**129. *Stilobezzia spadicoxalis* Tokunaga and Murachi, n. sp. (fig. 90, a).**

Small, yellow, but somewhat brownish in dry state; antenna with scape yellow, short basal flagellar segments very pale brown and almost colorless, long distal segments brown; scutum, scutellum, and postscutellum uniformly yellow; leg pale yellow, but fore coxae distinctly more brownish than in other legs; haltere pale yellow; abdomen yellow.

*Male*: Body length about 2.48 mm. Wing about 1.51 mm. by 0.45 mm.

Head yellowish brown to brown, with vertex more brownish. Eyes very narrowly separated above by less than half a facet. Maxillary palp with segments in proportion of 1.6:12.4:18.8:10.5:17.2. Antenna with scape yellow, short basal flagellar segments and plumose hairs very pale brown and almost hyaline, longer distal segments brown; segments 2 to 9, 2 to 10, 2 to 11, 10 to 14, 11 to 14, and 12 to 14 in proportion of 143.8:157.1:171.7:247.1:233.8:219.2; seven distal flagellar segments in proportion of 13.6:13.4:13.2:14:45.2:61.8:113.8.

Thorax, in dry state, brown and slightly shining, with dark setae, in alcoholic or mounted specimens, entirely yellow to pale yellowish brown; scutellum with three pairs of long bristles and sometimes median pair reduced to single bristle. Legs pale yellowish brown, but fore coxae distinctly more brownish than in other legs, in fore leg two basal segments each with one apical tarsal spur and 3 with two; in middle leg, basal three each with two apical spurs and 1 with additional sub-basal one; in hind leg, segment 1 with one apical spur and 2 to 3 each with two distinct apical spurs; leg segments in proportion of 40:38.5:24.3:13.3:3.9:3.5:5.4 in fore leg, 48:45.5:32:12.4:4.1:3.5:4.9 in middle leg, and 47.3:48:25.9:13.1:4.4:3.4:5.8 in hind leg.

Wing with anterior veins pale brown to slightly yellowish brown; macrotrichia absent on radial veins, several on distal one-third or one-fourth of  $M_1$  and a few at tip of  $M_2$ , trichia of membrane very sparse, on distal marginal area of cell  $R_s$ , and along distal margin of cell  $M_1$ , several arranged in line above distal one-fourth of  $M_1$  and below distal one-fifth of  $M_1$ . Venation:  $R_1$  ending above or slightly beyond tip of  $Cu_1$ ,  $R_s$  ending above or slightly beyond tip of  $M_{2+3}$ , second radial cell about four times as long as first, first radial cell rhombic and three times as long as wide, fMCu under middle of r-m or under origin of r-m,  $M_{1+2}$  longer than r-m and shorter than first radial cell. Haltere pale brown to pale yellow.



Abdomen brown to yellowish brown in dry state and pale brown to pale yellow in mounted specimen, sometimes basal two-thirds paler than caudal part. Hypopygium yellowish brown; tergite 9 paraboloid and shorter than basal width; sternite 9 transverse, almost straight at caudal margin; coxite short, curved evenly, and tapered; style as long as coxite, slightly narrowed at middle part, and dilated distally, dark at tip, and with small mesal ridge and ending in small tooth. Aedeagus with paired lateral chitinated plates, basal arms short and about one-fourth of entire length, each middle part expanded laterad forming semicircular lobe, distal one-third sharply pointed and curved caudad; parameres yellow, long, much longer than coxite, each basal stem gradually tapered distad, distal one-fourth curved ventrad, and forming round fan-like hyaline lamella; basal apodemes broad, transverse, slightly curved, pointed laterally, and truncate at mesal end.

*Female*: Body length about 2.35 mm. Wing about 1.45 mm. by 0.47 mm. Coloration and structure generally as in male with usual sexual differences.

Head and mouthparts pale brown to brown, with vertex more brownish. Eyes separated above as wide as half a facet. Maxillary palp with segments in proportion of 6.2:12.5:20.9:10.1:16. Antenna with scape yellow or orange yellow, short basal flagellar segments pale yellowish brown, but three or four distal segments annulate with brown tips; five long distal segments brown; AR about 1.64; proportion of eight distal segments about 14.8:18:18.5:37.8:39:40.6:38.5:55.7.

Thorax pale yellowish brown uniformly; scutellum with five or six strong setae and rarely with additional small accessory seta at either lateral side. Legs pale yellow to pale yellowish brown, but fore coxae more brownish, differing from other coxae; leg segments in proportion of 36.3:34.8:21.1:11:4.1:3.5:7.5 in fore leg, 42:43.5:28:11.4:4:3.7:7.4 in middle leg, and 45.6:45.5:24.5:11.4:38:33:7 in hind leg.

Wing with anterior veins very pale brown and almost hyaline, macrotrichia of veins on radial veins, distal half of  $M_1$ , and at tip of  $M_2$ , and sometimes at tip of  $M_{2+3}$ , macrotrichia of membrane on distal marginal area of cell  $R_5$ , along distal margin of cell  $M_1$ , and in line along distal margin of cell  $M_4$ . Venation:  $R_1$  ending above tip of  $Cu_1$ ,  $R_5$  ending beyond tip of  $M_{2+3}$ , second radial cell shorter than four times of first cell (95.7:28.2), fMCu under r-m,  $M_{1+2}$  subequal to first radial cell and slightly longer than r-m. Haltere pale brown to pale yellow.

Abdomen uniformly brownish, with cerci pale yellowish brown; two spermathecae oval, brown, slightly unequal, without chitinated ducts; one minute, round, and hyaline.

Holotype, male (US 64058), Mt. Chukumong, Wena I., Truk, 60 m., light trap, Dec. 28, 1952, Gressitt. Allotype, female (US), same data as for holotype. Paratypes:

Palau. Female, Koror, Mar. 15-25, 1948, Maehler.

Truk. Three males, seven females (BISHOP), Mt. Chukumong, Wena, 80 m., light trap, Dec. 27-28, 1952, Jan. 6, 1953, Gressitt; eight males, female, Mt. Unibot, Ton, 390 m., light trap in native forest, Jan. 4, 1953, Gressitt; 12 males, ten females, Mt. Unibot, Ton, light trap, Dec. 31, 1952 to Jan. 3, 1953, Gressitt; four males, female, Wena, light trap, Feb. 5, 1953, Gressitt; female, Pis, at light, 1948, Maehler.

Ponape. Male, ten females (BISHOP, CM), Agric. Exper. Sta., Colonia, light trap, Jan. 6-20, 1953, Gressitt.

Other specimens:

Palau. Six females, ten males, Ngerehelong Pen., Babelthuap, light trap, May 6-8, 1957, Sabrosky; female, male, Ngiwal, Babelthuap, May 19-20, 1957, Sabrosky; male, June 1, two females, June 3, 1957, Ngaremlengui, Babelthuap,

Sabrosky; two males, Melekeiok, Babelthuap, May 22, 1957, Sabrosky; male, Imeliik, Babelthuap, June 5, 1957, Sabrosky; female, Koror, May 30, 1957, Sabrosky.

Yap. Male, Dugor Distr., Yap I., Jan. 6, 1957, Sabrosky.

Truk. Three females, Ton, Apr. 7, 1949, Potts.

Ponape. Male, Exper. Sta., Aug. 9, 1950, Adams.

DISTRIBUTION: Caroline Is. (Palau, Yap, Truk, Ponape).

This species is very closely related to Micronesian *S. longistyla*, *S. subsoror*, and *S. fulviscuta*; these four species may be separated by the difference of the male hypopygia, but the females are more closely similar to each other and only slightly different in the coloration of the antennae, scutum, and fore coxae, and in the size of the wings as shown in the key.

**130. *Stilobezzia subsoror* Tokunaga (fig. 90, b).**

*Stilobezzia subsoror* Tokunaga, 1941, Annot. Zool. Japon. 20 (2): 116 (Truk).

Small, yellow; thoracic scutum yellowish or very pale brownish yellow; abdomen pale brown; wing shorter than 1.3 mm.; parameres of male hypopygium yellow.

*Male*: Body length about 2.02 mm. Wing about 1.1 mm. by 0.33 mm.

Head brown or pale brown, with eyes separated above as wide as a facet; maxillary palp brown, with five segments in proportion of 5:7.9:15:8.8:13.5. Antenna with scape yellowish brown, short basal segments and their plumose hairs very pale brown, long distal segments brown; proportion of eight distal flagellar segments 9.7:9.5:9.2:9:11.3:32.3:47.7:72.3; segments 2 to 9, 2 to 10, 2 to 11, 10 to 14, 11 to 14, and 12 to 14 in proportion of 100.6:110.3:121:181.3:171.6:160.9.

Thorax yellowish pale brown, with dark setae; scutellum with pair of lateral setae and three, or rarely two, median setae. Legs yellowish very pale brown; in fore leg, basal two segments each with apical tarsal spur and 2 with two; in middle leg, basal segment with sub-basal and two apical spurs and following two each with two apical; in hind leg, basal one with apical spur, following with two apical, but rarely segment 2 with apical spur; leg segments, except for basal two, in proportion of 34.3:29:16.8:8.7:3.5:2.8:5.5 in fore leg, 39.3:34.3:22.3:9.5:3.8:2.8:4.5 in middle leg, and 45.3:34.3:17.5:8.8:3.5:2.7:5.5 in hind leg.

Wing with anterior veins almost colorless and hyaline; macrotrichia on radial veins, distal one-third of  $M_1$ , and at tip of  $M_2$ , but rarely  $M_2$  without trichia even at tip; those on membrane distributed along distal margins of cells  $R_5$  and  $M_1$  and in a line above distal part of  $M_1$ , but rarely cell  $M_1$  without trichia beside fringe. Venation:  $R_1$  ending just before or at level of tip of  $Cu_1$ ,  $R_5$  ending above tip of  $M_{3+4}$ , first radial cell about one-third as long as second cell (23.5:74),  $M_{1+2}$  longer than r-m and subequal to, or slightly shorter than, first radial cell, fMCu under base of r-m. Haltere pale yellowish brown or pale brown.

Abdomen pale brown; hypopygium yellowish brown, similar to *S. fulviscuta* but parameres yellow, coxite not so strongly expanded at base, basal apodemes of parameres rather smaller.

*Female*: Body length about 1.75 mm. Wing about 1.04 mm. by 0.33 mm. Coloration and general structure as in male with usual sexual differences.

Head and mouthparts brown; eyes separated above as wide as a facet; maxillary palp with segments in proportion of 5:9:14:8:13. Antenna with scape yellowish brown, flagellum brown; AR about 1.68; eight distal flagellar segments in proportion of 3.7:3.8:4.2:8.6:9.2:9.3:9.8:13.7.

Thorax with two pairs of setae on scutellum; legs with coxae yellow or yellowish very pale brown as in other segments, proportion of segments 30.5:29:17.5:8.5:2.5:2:4.8 in fore leg, 34:31:21:9:3.5:2.7:4.5 in middle leg, and 34.5:34.5:19.5:8.8:3:2.8:5.5 in hind leg; in fore and hind legs, basal segment with apical tarsal spur, 2 with one or two apical; in middle leg, basal segment with sub-basal and two apical spurs, 2 to 3 with two apical spurs.

Wing with main veins very pale brown; macrotrichia of veins found on radial veins, distal one-third or half of  $M_1$ , at distal tip or on quarter of  $M_2$ , and at tip of  $M_{3+4}$ ; those on membrane sparsely distributed along distal margins of cells  $M_1$  and  $M_2$ . Venation:  $R_1$  ending at level of tip of  $Cu_1$ ,  $R_s$  ending beyond tip of  $M_{3+4}$ , second radial cell scarcely three times as long as first cell (65:22.7),  $fMCu$  under r-m,  $M_{1+2}$  longer than r-m but shorter than first radial cell. Haltere pale brown.

Abdomen uniformly pale brown; two spermathecae brown, oval, unequal, with hyaline dots and very short chitinized duct, one spermatheca very minute, round, and brown.

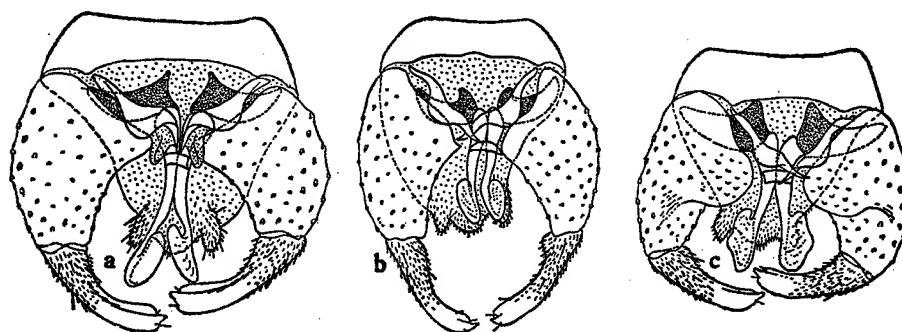


FIGURE 90.—Hypopygium, male: a, *Stilobezzia spadicicoxalis*; b, *S. subsoror*; c, *S. fulviscuta*.

DISTRIBUTION: Caroline Is.

PALAU. BABELTHUAP: Ngiwal, three females, May 1957, Sabrosky. NGERKABESANG: Female, May 1957, Sabrosky.

PONAPE. Colonia, hydroelectric plant, female, two males, Aug. 1946, Townes; Colonia, male, July-Sept. 1950, Adams; Exper. Sta., female, July-Sept. 1950, Adams; Nanipil, female, two males, Feb. 1948, Dybas; Nanipil, Net Distr., six females, four males, sweeping, Feb. 1948, Dybas; Nanpohnmal, southeast part, three females, three males, light trap, Jan. 1953, Gressitt; Mt. Temwetemwensekir, 180 m., 18 females, 14 males, light trap, Jan. 1953, Gressitt; Mt. Kupwurisio, three males, at north slope, Mar. 1948, Dybas; Mt. Dolen Nankep, 540-570 m., three females, three males, July 1946, Townes.

**131. *Stilobezzia fulviscuta* Tokunaga and Murachi, n. sp. (fig. 90, c).**

Yellowish-brown to orange-brown, small; scutum, in dry state, brown or yellowish brown and, in alcoholic or mounted specimen, uniformly orange brown; abdomen pale yellowish brown; antenna with scape yellowish brown and flagellar segments uniformly brown or pale brown. Legs, including coxae, uniformly pale yellowish brown. Wing longer

than 1.3 mm., with anterior veins pale brown. Haltere pale yellowish brown. Parameres of male hypopygium brown.

*Male:* Body length about 2.69 mm. Wing about 1.49 mm. by 0.47 mm.

Head almost uniformly brown including mouthparts, but vertex more brownish; clypeus usually with four pairs of lateral setae and rarely three or five. Eyes separated above as wide as half a facet. Maxillary palp with segments in proportion of 6.3:14:21.5:12.4:18.4. Antenna with scape yellowish brown, other segments brown, and plumose hairs also brown or slightly paler; segments 2 to 9, 2 to 10, 2 to 11, 10 to 14, 11 to 14, and 12 to 14 in proportion of 125.5:138.5:152.4:233.4:220.4:206.5; seven distal antennal segments in proportion of 12.8:12.7:13.2:14.7:41.7:64.3:105.

Thorax pale yellowish brown, but scutum uniformly orange brown and rarely slightly dark orange; scutellum always with three median and pair of lateral bristles and without small accessory setae. Legs, including coxae, uniformly pale brownish yellow; in fore and hind legs, two basal tarsal segments each with distinct apical tarsal spur and 3 with two apical, but sometimes hind tarsal segment 2 with two; in middle leg, basal three each with two apical spurs and 1 with additional sub-basal one; leg segments, except for coxae and trochanters, in proportion of 42:38.3:22.5:13.2:4.5:3.5:5.7 in fore leg, 48.2:47.7:28.3:13.5:5.3:3.3:5.7 in middle leg, and 48.3:48.5:25.2:12.9:5.3:3.3:6 in hind leg.

Wing with anterior veins very pale brown and hyaline; macrotrichia of veins one to four on R, one to three on Rs, R<sub>1</sub> without or with one trichia, two to several on distal one-fifth to half of M<sub>1</sub>, M<sub>2</sub> without or with few trichia at tip; macrotrichia of membrane along distal margins of cells R<sub>5</sub> in two lines and M<sub>1</sub> in one line and several in line above distal one-third of M<sub>1</sub> in cell R<sub>6</sub>. Venation: R<sub>1</sub> ending at level of tip of Cu<sub>1</sub>, Rs ending beyond tip of M<sub>3+4</sub>, second radial cell about 3.3 as long as first, fMCu under r-m, M<sub>1+2</sub> longer than r-m and subequal to, or shorter than, first radial cell. Haltere pale brownish yellow to pale brown.

Abdomen pale brownish yellow. Hypopygium brown; tergite 9 somewhat triangular, as long as basal width, caudal margin round at tip; sternite 9 transverse and its caudal margin very slightly concave; coxite swollen at base and suddenly narrowed on distal half; style stout, slightly arcuate, not distinctly tapered, pointed at tip, and each ending in dark apical tooth. Aedeagus triangular, with pair of slender lateral chitinated plates, not distinctly curved, slender on basal half, slightly expanded beyond middle, and sharply pointed on distal one-fourth; parameres brown differing from allied *S. subseror*, extended slightly beyond tip of tergite 9, each stem part gradually tapered distad, and distal half curved evenly ventrad and ending in fan-like, round hyaline lamella; basal apodemes large, somewhat triangular, each mesal end truncate and bluntly produced cephalad at cephalic angle, and lateral part elongate laterad and ending at lateroproximal edge of coxite, general feature of apodemes similar to those of *S. spadicoxalis*, but longer and less curved.

*Female:* Body length about 2.76 mm. Wing about 1.73 mm. by 0.61 mm. Generally as in male in coloration and structure except for usual sexual differences.

Head with segments of maxillary palp in proportion of 6:17:25.6:13:22.8. Antenna with scape yellowish brown, flagellum brown; AR about 1.58 (1.4-1.7); eight distal segments in proportion of 5.2:5.7:6:12.6:13.4:14:14.3:20.8.

Thorax with pair of long lateral setae on scutellum and three, and sometimes four, long median setae; leg segments, except for basal two, 46:45.4:25.5:13.9:5.8:4.3:9.5 in fore leg, 56.6:54:33.6:14.6:5.4:4.4:9.6 in middle leg, and 56.9:55.9:30.7:12.4:5:4:8.8 in hind leg; hind tarsal segment 2 with two apical tarsal spurs and very rarely one, number of spurs of other segments as in male.

Wing with anterior veins pale brown or yellowish pale brown; several macrotrichia on radial veins, on distal half of M<sub>1</sub>, and a few trichia on distal one-third or at tip of M<sub>3+4</sub>; cells R<sub>5</sub>, M<sub>1</sub>, and M<sub>2</sub> sparsely hairy on distal marginal areas and several setae arranged in line above distal half of M<sub>1</sub>; cell M<sub>2</sub> rarely without macrotrichia. Venation: R<sub>1</sub> ending above and rarely just before tip of Cu<sub>1</sub>, Rs ending beyond tip of M<sub>3+4</sub>, first radial cell about one-third of second cell (41:131), fMCu under r-m.

Abdomen including cerci yellowish pale brown; two spermathecae oval, unequal, brown, with hyaline punctures and without chitinized duct; one round and minute.

Holotype, male (US 64059), Mt. Dolen Nankep, Ponape, 550 m., Aug. 11, 1946, Townes. Allotype, female (US), same data as for holotype, Aug. 9, 1946, Townes. Paratypes:

Palau. Female, Ngatkip, Babelthuap, 1946, Townes; female, west of Ulimang, Babelthuap, wooded valley, Dec. 21, 1947, Dybas; female, East Ngatpang, Babelthuap, 65 m., light trap, Dec. 9, 1952, Gressitt; male, Koror, Nov. 24, 1947, Dybas; female, Koror, Mar. 15-25, 1948, Maehler; nine females, southwest Koror, Dec. 11, 1952, Gressitt.

Yap. Female, hill behind Yaptown, light trap, Nov. 28, 1952, Gressitt.

Truk. Female, Wena, Feb. 5, 1953, Gressitt.

Ponape. Seven males, ten females, Colonia, some from hydroelectric plant, Aug. 8-9, 1946, Townes; male, six females (BISHOP, CM), Agric. Exper. Sta., light trap, Jan. 6-11, 1953, Gressitt; male, female, Colonia, July-Sept. 1950, Adams; three males, seven females, Mt. Dolen Nankep, 500-600 m., Aug. 10-13, 1946, Townes; male, Madolenihm Plantation, July-Sept. 1950, Adams; female, Mt. Dolotomw, July-Sept. 1950, Adams; four males, female, Nanipil, Feb. 25-27, 1948, Dybas; five males, nine females, Mt. Temwetemwensekir, light trap, Jan. 14-16, 1953, Gressitt; female, male, Mt. Kupwuriso, 530 m., beating vegetation at summit, Mar. 8-11, 1948, Dybas; female, Mt. Nahnalaud, 300 m., northwest slope, Mar. 19, 1948, Dybas; three females, male, Nanpohnmal, southern part, light trap in mountain, Jan. 11, 1953, Gressitt; male, Mt. Pairot, 300 m., Mar. 14, 1943, Dybas.

#### Other specimens:

Truk. Three females, male, Ton, Apr. 7, 1949, Potts.

Ponape. Five females, four males, Nanipil, Net Distr., Feb. 25, 1948, Dybas; female, Mt. Temwetemwensekir, Mar. 22, 1948, Dybas; female, male, Mt. Kupwuriso, at north slope, Mar. 11, 1948, Dybas.

DISTRIBUTION: Caroline Is. (Palau, Yap, Truk, Ponape).

This species is so very closely allied to *S. subsoror* that the two species are almost indistinguishable in the dry state. However, this species is somewhat larger, the wing is more than 1.3 mm., while, in *subsoror*, the wing is less than 1.3 mm. In mounted specimens, the coloration is rather different; in *subsoror*, the thoracic scutum is yellowish, the abdomen and halteres are brownish, and the male parameres are yellow.

#### Genus *Serromyia* Meigen (1818)

*Prionomyia* Stephens (1829), *Ceratolophus* Kieffer (1899), and *Johannseniella* Williston (1907).

Body slender, rather large, larger than 2 mm. Eyes bare. Antenna 14-segmented; female antenna with last five segments long and cylindrical; male antenna with distinct

plumose hairs. Mesoscutum with fine bristles arranged mostly in dorsocentral and acrostichal series; humeral pits obscure. Fore and middle legs slender and without femoral spines; tarsal segment 4 cordiform, claws nearly equal and moderate; hind legs with femora greatly swollen in both sexes, femora with many ventral spines, tibiae curved at bases, tarsal segment 4 cylindrical, claws in female very unequal; empodium absent. Wing with fine microtrichia on membrane, sometimes with few macrotrichia on apical area; Rs extending two-thirds of wing; two radial cells distinct, second cell longer than first; intercalary fork indistinct, median fork sessile or with short stalk,  $M_2$  not atrophied at base; alula bare. Male hypopygium with tergite 9 longer than basal width and with prominent anal points; sternite 9 transverse, but not very narrow; coxite stout; style long and slender; aedeagus with basal arms widely divergent and slender at basal tips; parameres connected at middle part.

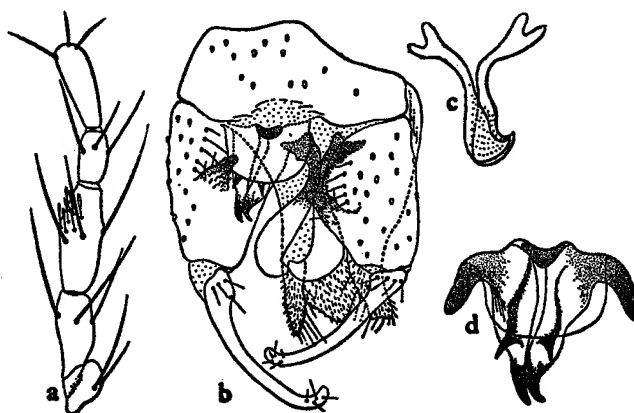


FIGURE 91.—*Serromyia esakii*, male: a, maxillary palp; b, hypopygium; c, pair of parameres; d, aedeagus.

132. *Serromyia esakii* Tokunaga (fig. 91).

*Serromyia esakii* Tokunaga, 1940, Philippine Jour. Sci. 71 (2): 218 (Kusaie); 1940, Tenthredo 3 (2): 184.

Yellow and brown; fore and middle legs mainly yellow, only brown at tips of tibiae, hind legs with femora entirely brown and tibiae brown at both ends and broadly yellow on middle part. Wing vein  $M_{1+2}$  rather long, veins colorless and hyaline.

**Female:** Body about 2.25 mm. long, yellow. Head yellowish brown, with appendages brownish yellow. Thorax yellow, not shiny, setae black; mesoscutum with three orange-yellow vittae; pleural and sternal sclerites yellow, with brownish clouds. Legs with coxae and trochanters brownish yellow; other segments mainly yellowish white; fore and middle tibiae with distal parts brown; hind legs with knee joints black; hind tibiae broadly dark brown at bases. Haltere white, knob dark on marginal area. Wing without colored marking; veins hyaline and colorless. Abdomen white.

Head with eyes bare, narrowly separated above. Antenna with terminal stylet blunt; AR 1.2-1.3; distal seven segments in proportion of 14:14:24:27:31:31:38.

Thorax without scutal spine on anterior margin. Fore and middle legs with tarsal segment 4 flattened, obliquely truncate; hind leg with femur strongly thickened, with about 20 strong spines on ventral side; hind tibia strongly curved basally; tarsal segment 1 of all legs with basal and apical spur-like bristle; segment 1 of fore legs with three

similar bristles on middle part; tarsal segment 2 and 3 of fore and middle legs with one or two apical spur-like bristles; other tarsal segments without these spurs; tarsal claws of fore and middle legs small, symmetrical; hind tarsal claws very unequal, proportion of paired claws 17:85; longer claw slender, very long, longer than tarsal segment 5 (85:50), with small basal tooth; shorter claw simple; proportion of segments 30:28:15:6.5:4:2.5:4 in fore leg, 36:35:19:8:5:2.5:4 in middle leg, and 49:38:20:11:8:6:8 in hind leg.

Wing with macrotrichia restricted to less than 14 at margin of extreme tip. Venation: Costa ending at three-fourths of wing, proportion of first and second radial cells 11:19, those of  $R_1$  and  $R_s$  14:30, r-m almost vertical and very short,  $M_{1+2}$  rather long and about three times r-m, fMCu under r-m.

*Male*: Body about 2.17 mm. long, generally dull yellow. Wings about 1.27 mm. by 0.36 mm., with veins colorless and hyaline.

Head pale brown, with eyes separated above as wide as 1.2 or 2 facets, proboscis about 0.6 as long as head capsule (15:25); clypeus with about 16 setae. Maxillary palp rather slender, segment 3 with several scattered sensillae and without sensory pore; five segments about 7:15:20:10:17 in relative length. Antenna with scape brown, basal nine flagellar segments and their plumose hairs very pale brownish white, segment 11 whitish on basal half and brownish on apical half, distal three segments brownish, apical stylet absent, relative combined length of segments 2 to 11 and 12 to 14 about 120:97, distal nine segments about 11:10:10:10:9:11:27.5:34:32 in proportional length.

Thorax dull yellow or pale brownish yellow, with setae pale brown; scutum with faint median, brownish cloud on anterior half, scutellum white, with small median dark spot, four large setae and several minute hairs; pleural and sternal sides far more brownish than tergal side; postscutellum uniformly brown; prosternite with pair of horn-like pubescent projections between fore coxal bases. Legs with coxae and trochanters brown, femora and tibiae yellowish pale brown, tibial apical ends narrowly brown, tarsi white. Tarsal spines in fore leg, tarsal segment 1 with three sub-basal, one median and one apical spine; in middle, 1 with sub-basal, median and two apical, 2 and 3 with two apical respectively; and in hind leg, 1 with sub-basal spine; fore femur strongly thickened with about 23 spines on entire length of ventral side; claws equal, small and bifid only at extreme tips; hind leg with TR about 1.88 and seven bristles of tibial comb; relative length of leg segments, except for basal two, about 152:145:73:32:22:14:22 in fore, 185:178:89:40:25:14:22 in middle, and 233:187:94:50:32:19:27 in hind leg.

Wing almost entirely colorless and hyaline, no macrotrichia; costa ending at basal 0.76 of wing length (79:104),  $R_s$  ending in costa at three-fourths of wing (71:95),  $R$ ,  $M$ , and stem of fMCu in proportion of 38:38:40.5; second radial cell longer than first (17:13), tip slightly beyond level of tip of  $M_{3+4}$ , junction of two radial cells at level of basal one-third of wing margin between tips of  $M_{3+4}$  and  $Cu_1$ ;  $R_s$  about 2.3 of  $R_1$  (31.5:14), r-m about half as long as  $M_{1+2}$  (4:10),  $M_{1+2}$  as long as first radial cell, fMCu under origin of r-m cross vein, base of  $M_s$  and distal half of  $M_{3+4}$  almost atrophied. Haltere white, knob with small fuscous central spot.

Abdomen mainly whitish, but caudal segments gradually more fuscous. Hypopygium brown; tergite 9 elongate, much longer than basal width, caudal half beyond sternite 9 trapezoid, tapered caudad, extending beyond tip of coxite truncate at caudal margin, with paired pubescent and setigerous anal points and pubescent, bluntly triangular median lobe on caudoventral side; sternite 9 large, setigerous with demarcation of caudal margin not distinct, caudal membrane bare; coxite conical, longer than basal width (45:32), basally extended mesad, with small tubercle at middle of mesal side; style very slender, almost bare, slightly curved, distinctly swollen at base, arcuate and longer than coxite (47:45), with tip somewhat pointed and setigerous with few minute setae. Aedeagus complicated, with ventral semicircular swelling, pair of short recurved basal arms, and pair of peculiar dorsal processes; large median lobe thinly chitinized, round on caudolateral angles, very slightly concave on caudal margin, anterior margin strongly chitinized, and slightly concave at middle part; basal arms rather short, tapered, strongly recurved laterocaudad, and ending within bases of coxites; accessory inner processes strongly chitinized, arising from

basal ridge of aedeagus, extending caudad in parallel position, somewhat broadened at middle part, gradually tapered on distal one-fourth and curved dorsad, ending in curved blunt tips, each process with slender chitinized filament on basal part and small thorn-like projection beyond middle. Parameres large, as long as coxite (46:45), rather thin and plate-like, basally contiguous, vertically arranged side by side, basal parts dark, narrowed at basal one-third, broadened and arcuate on apical two-thirds, and ending in recurved and narrowed apices, apical part curved ventrad, basal roots thickened, divergent widely, somewhat Y-shape.

DISTRIBUTION: Caroline Is.

Allotype, male (BISHOP 2601), Mutunlik, Kusaie, light trap, Jan. 1953, Gressitt.

PALAU. BABELTHUAP: Ngarabau, female, light trap, May 1957, Sabrosky.

ULEBSEHEL: Southeast part, male, Apr. 1957, Sabrosky.

#### Genus *Monohalea* Kieffer (1917)

*Schizohalea* Kieffer (1917) and *Allohelea* Kieffer (1917).

Body rather short, not very hairy. Eyes bare or finely pubescent. Mesonotum with humeral pits very small. Fore and middle legs unmodified, tarsal segment 4 short but cylindrical, claws rather small and equal in both sexes. Femora and tibiae of hind legs thickened, but femora without spines; in both sexes, hind tarsal segment 5 with one long and one short claw or with single claws; empodium absent. Wing with fine microtrichia, but only very few macrotrichia at extreme tip. Costa extending well beyond middle of wing; two radial cells well formed, second radial cell considerably longer than first; intercalary fork fairly distinct; cross vein r-m somewhat vertical; median fork with short stem,  $M_2$  slightly, or not, interrupted at base; anal vein slightly thickened in middle, but without fold at thickening. Male hypopygium with tergite 9 broadly bilobed caudad; parameres basally fused.

#### KEY TO MICRONESIAN SPECIES OF MONOHELEA

1. Wing without marking.....134. *albiclavatoris*  
Wing with distinct dark marking..... 2
2. Legs with femora and tibiae mainly yellowish; hind femur and tibia with dark bands or spots. Wing with two small dark spots in basal radial cell.....135. *palauensis*  
Legs with femora and tibiae mainly dark or brown; hind femur and tibia without distinct bands or spots. Wing with one dark spot or without dark spots in basal radial cell..... 3
3. Wing with an isolated dark small spot at middle of basal radial cell. Scutum with yellowish spots and many dark dots at bases of setae.....133. *insularis*  
Wing without dark small spots in basal radial cell. Scutum uniformly brown and without yellowish spots and dark dots.....136. *mcDanieli*

#### 133. *Monohalea insularis* Tokunaga (fig. 92, a, b).

*Monohalea insularis* Tokunaga, 1941, Annot. Zool. Japon. 20 (2): 115 (Kusaie).

Small, dark-brown; scutum with many yellowish spots and many dark dots; legs dark brown, but tarsi yellowish; wings with subconfluent dark markings.



*Male:* Body length 1-2 mm. Wing about 1.22 mm. by 0.47 mm.

Head yellowish brown, or dark brown. Eyes narrowly separated above as wide as one and one-half facets. Mouthparts pale yellowish brown, with maxillary palpal segments in proportion of 5.5:10:17:10:18. Antenna brown, with plumose hairs well developed; segments 2 to 8, 2 to 9, 2 to 10, 2 to 11, 9 to 14, 10 to 14, 11 to 14, and 12 to 14 in proportion of 25.5:28:31:34.5:33:30.5:27.5:24; proportion of distal seven segments 10.8:11:11:13.8:32:28.9:30.

Thorax dark brown; scutum with many setigerous black dots and yellow or yellowish-brown marking as follows: Two discontinuous vittae on median part, one circular spot on either humeral area, two or three ill-defined spots on either lateral side. Scutellum yellow to brown and with four distinct setae and several small setae; postscutellum brown to dark brown. Legs with coxae, trochanters, femora, and tibiae dark brown or black, but basal ends of tibiae narrowly yellowish; tarsal segments yellowish brown or paler. In fore leg, segment 1 with three tarsal spurs, one at base, one at middle, and one at end, 2 and 3 each with apical spur, and 4 with two apical spurs; in middle leg, segment 1 with at least three spurs, one at base and two at tip, and at most with seven spurs, two at base, two at middle, two at tip and one at preapical position, following three segments each with two at tip; in hind leg, segment 1 with two strong spurs, one at base, and one at tip, 2 with two at tip; all other tarsal segments without spurs. Claws of fore and middle legs equal and deeply bifid, but those of hind leg very unequal, longer one fully five times as long as shorter one and much longer than tarsal segment 5 (47.5:32); hind basitarsus distinctly undulate. Leg segments in proportion of 43:40:23:10:15.5:4.3:5 in fore leg, 48:47:27:12:6:4.2:5.7 in middle leg, and 60:56:19:13:6:8:8 in hind leg.

Wing with microtrichia on membrane but without macrotrichia on veins and membrane; veins yellowish brown; costal and radial cells brown to dark brown. Dark markings of wing include small spot at middle of basal radial cell, large spot at base of cell  $R_5$ , transverse spot at middle of cell  $R_5$  or at position of end of  $R_5$ , transverse spot at middle of cell  $M_1$ , small spot under  $M_{1+2}$ , rather larger spot under middle of  $M_2$  in cell  $M_2$ , and obscure dark clouds covering veins  $M_1$ ,  $M_2$ ,  $M_{3+4}$ ,  $Cu_1$ , stem of fMCu, and at middle of anal cell. Venation: Costa slightly produced beyond tip of  $R_5$ , proportion of two radial cells about 6.3:14.5, those of  $R_1$  and  $R_5$  about 8:18, fMCu just before base of first radial cell,  $M_{3+4}$  ending just before tip of  $R_5$ . Haltere yellow.

Abdomen with tergites yellow, pleural sides dark brown, sternites 1 to 3 yellow and 4 to 7 brown. Hypopygium brown; tergite 9 small, somewhat square, and slightly round caudad; sternite 9 very short and very broad; coxite large and coniform; style slender, almost as long as coxite, slightly curved, and basal one-third slightly swollen. Aedeagus with paired lateral basal plates and stout caudal projection bilobate at tip; parameres and apodemes fused, with pair of basal rod-like projections and pair of short lateral projections ending at bases of coxites, median part broad and with large semicircular window at basal area, laterocaudal parts sharply extending caudad and each ending in minute hook at level of aedeagal caudal end.

*Female:* Body length about 2.02 mm. Wing about 1.22 mm. by 0.47 mm. Coloration and structure mainly as in male except for usual sexual differences.

Head with eyes separated above as wide as half a facet; maxillary palp yellow, segments in proportion of 5:10:15.7:10.5:20. Antenna broken.

Thorax closely as in male. Legs with knee joints more distinctly yellow than in male; fore tarsus without spurs; in middle leg, segment 1 with tarsal spur at base, one at middle, and one at tip, segment 2 with one at tip; in hind leg, segment 1 with one at base and one at tip, following three segments each with two at tip; claws of fore and middle legs equal, rather small, each with small basal tooth, those of hind legs single, very large, with small basal rod-like tooth, longer than tarsal segment 5 and longer than three times basal tooth (50:28:15). Leg segments in proportion of 38:38:20:8.5:5.8:4:7 in fore leg, 45:40:21:8.5:5:3.3:6 in middle leg, and 56:51:19:10:6:7:7 in hind leg.

Wing darker and more extensively dark than in male, dark spots being almost confluent. Venation:  $R_1$  ending before tip of  $M_{3+4}$  and shorter than half of  $R_5$  (13.5:31),  $R_5$

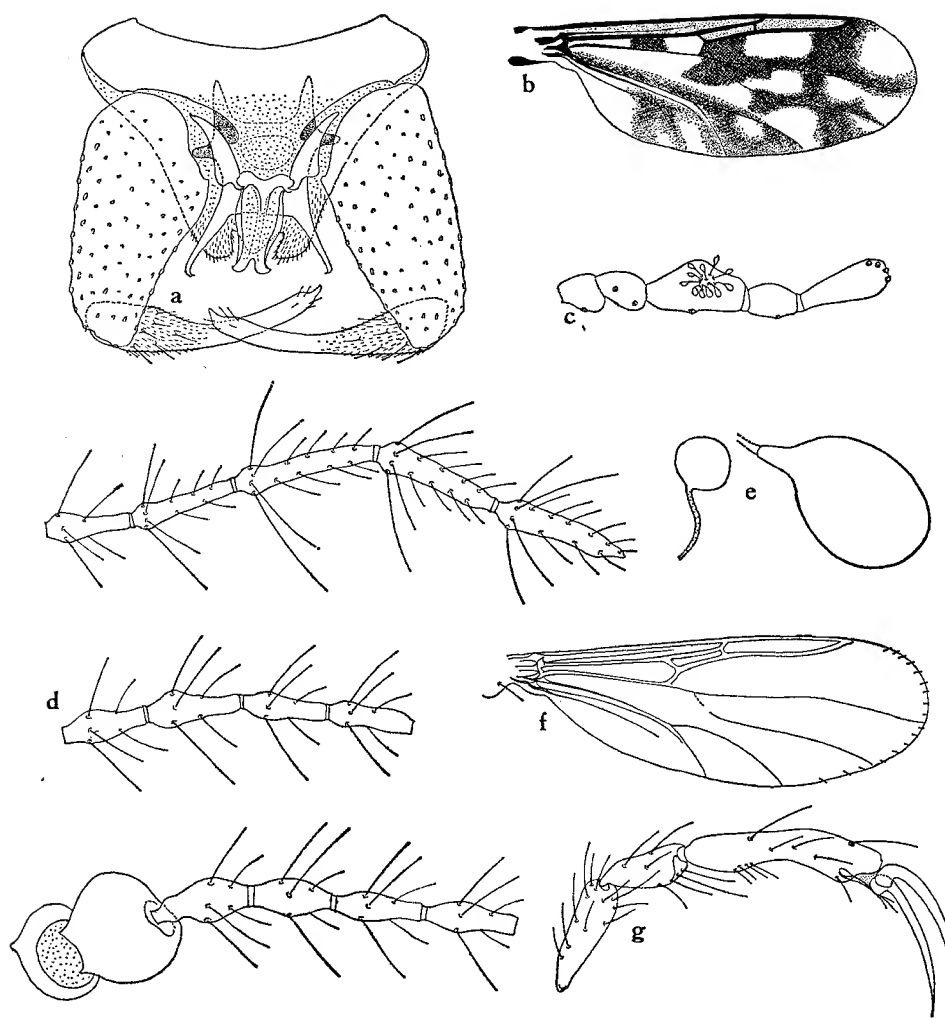


FIGURE 92.—a, b, *Monohelea insularis*: a, hypopygium, male; b, wing, female. c-g, *M. (Schizoelea) albiclavatoris*, female: c, maxillary palp; d, antenna; e, spermathecae; f, wing; g, distal part of fore leg.

ending before tip of  $M_2$ , second radial cell about twice as long as first cell (21:10),  $M_{1+2}$  subequal to r-m (5:4), fMCu just before end of r-m, forking point between  $M_1$  and  $M_2$  under middle of first radial cell; veins R and  $R_1$  setigerous.

Abdomen as in male in color but tergite 3 and following tergites each with narrow brown band at caudal margin; cerci yellow; two spermathecae brown, subspherical, slightly unequal, each with short, but distinct, chitinized duct, one minute and tubular.

**DISTRIBUTION:** Caroline Is.

Allotype, female (US), Wena, Truk, July 1946, Townes.

PALAU. KOROR: Southwest part, female, light trap, Dec. 1952, Gressitt.

TRUK. WENA: Mt. Chukumong, 80 m., male, light trap, Jan. 1953, Gressitt. TON: Mt. Unibot, 200 m., female, light trap, Dec. 1952, Gressitt; Mt. Unibot, 32 m., six females, light trap, Dec. 1952 to Jan. 1953, Gressitt.

**134. *Monohalea (Schizohalea) albiclavatoris* Tokunaga and Murachi, n. sp.**  
(fig. 92, c-g).

Small, dark; female antenna with four distal segments distinctly longer than preceding ones, segment 10 not different from basal segments in shape and size; thoracic scutum uniformly dark brown, scutellum also dark brown, with pair of lateral and single median seta; legs with penultimate tarsal segments somewhat cylindrical, but slightly clavate, and each with apical spur, ultimate tarsal segments elongate, about 2.3 as long as preceding one and each with somewhat pad-like erection on sub-basal part of ventral side; claws of fore and middle legs very long, longer than half of ultimate segment, simple and equal; empodium vestigial, simple, and hair-like; wings without marking and closely similar to those of *Stilobezzia*, with macrotrichia very sparse, arranged closely along fringe of setae in cells  $R_s$ ,  $M_1$ , and  $M_2$ ; costal vein long, ending at about basal three quarters of wing and slightly produced beyond tip of  $R_s$ ,  $R_s$  about three times as long as  $R_1$ , two radial cells well developed, second radial cell about twice as long as first; two spermathecae very unequal and spherical.

*Female:* Body length about 1.3 mm. Wing about 0.96 mm. by 0.35 mm. General coloration dark brown to brown.

Head entirely dark brown, including mouthparts and sparsely setigerous with short setae, with eyes entirely finely pubescent with short hairs, hardly as long as height of facets, and separated above as wide as two facets. Mouthparts rather short; clypeus with two pairs of setae; mandibles suddenly narrowed at tip, each with about eight saw-like teeth on mesal edge and four to five minute, spine-like processes on lateral edge of apical tapered part; maxillary palp brown, each with shallow sensory depression, in which several sensillae are found, beyond middle of segment 3; five segments in proportion of 4:6:11:5:10. Antenna with socket-rings well developed, scape dark brown and spherical, flagellar segments brown and slender; basal segments 2 to 3 somewhat fusiform, segments 4 to 10 subequal in shape and length and tapered, segment 11 about 1.3 as long as preceding one, following two much longer than 11 and ultimate segment subequal in length to penultimate, tapered as in other preceding segments, rather pointed at tip, and without terminal stylet; proportion of antennal segments about 20:18:15:15:15:16:16:16:15.5:15.5:20:25:23:22; proportion of segments 2 to 9, 2 to 10, 10 to 14, and 11 to 14 about 124.5:142:107.5:91; AR of five and four distal segments about 0.64 and 0.86.

Thorax dark or dark brown, not shiny, very scantily setigerous with short dark-brown setae, with very small humeral pits on scutum; scutellum brown and with two lateral and single median seta. Legs almost entirely dark brown, but, in fore and middle legs, mesal sides of coxae, entire trochanters, and basal ends of femora yellowish; in hind leg, all segments darker than other legs, without yellowish parts. All legs not strongly setigerous, hind femur slightly arcuate, hind tarsal segment 1 curved at base; in fore and middle legs, penultimate tarsal segments all subcylindrical, not cordiform, and last tarsal segments

slightly arcuate, long, about 2.3 as long as penultimate, and each with small erection on sub-basal part of ventral side; claws of fore and middle legs large, slender, simple, equal, about 0.87 (20:23) as long as last segment in fore leg and 0.74 (17:23) in middle leg; four basal tarsal segments of fore and middle legs each with single apical spur, tarsal segment 1 of hind leg with sub-basal spur; leg segments, except for basal two, about 110:105:60:25:14:10:23 in fore leg, 128:124:65:22:13:10:23 in middle leg, and 146:135:73:?:?:?:? in hind leg, four tarsal segments broken.

Wing uniformly slightly fuscous, with very fine dot-like microtrichia, macrotrichia very sparse even on main veins; Rs with single trichia on preapical part, other veins except for costa without trichia; trichia on membrane very closely arranged along fringe, about ten trichia at apical margin of cell  $R_5$ , 4 or 5 of cell  $M_1$ , and 2 or 3 of cell  $M_2$ . Venation: Very closely similar to that of *Stilobezzia*, costa very long, extending to basal eight-ninths of wing (64:76) and slightly produced beyond tip of  $R_5$ ,  $R_5$  about three times as long as  $R_1$  (30:10), second radial cell about twice as long as first cell (19:9), r-m distinctly oblique, as long as basal section of  $R_5$ , and situated at about basal four-tenths of wing (33:76),  $M_{1+2}$  as long as r-m, base of  $M_2$  slightly atrophied,  $M_{3+4}$  ending far before tip of  $R_5$ ,  $Cu_1$  ending under tip of  $R_1$ . Haltere with white knob.

Abdomen rather short, suboval, very sparsely setigerous, rather dark brown, but somewhat paler than thorax, cerci also dark brown; two spermathecae brown, unequal, sub-spherical, larger one 18 by 15 units and with short (4.5 units) chitinized duct, and smaller one 6.5 by 7 units.

Male: Unknown.

Holotype, female (US 64060), Mt. Chukumong, Wena I., Truk, 50 m., light trap, Dec. 27, 1952, Gressitt.

DISTRIBUTION: Caroline Is. (Truk).

This species belongs to the subgenus *Schizohalea* and is somewhat related to *M. leucopæza* Meigen but, in *leucopæza*, the five distal segments of the female antennae are normally elongate, differing from the preceding segments, the scutellum has six bristles, the wing vein  $R_5$  is rather short, twice as long as  $R_1$ , and the costa ends at, or slightly before, the level of the tip of  $M_{3+4}$ , differing from this species.

### 135. *Monohelea palauensis* Tokunaga, n. sp. (fig. 93, a-j).

Medium size, dull yellow, with spotted wings and banded hind legs. Maxillary palp slender, with sensory pore small. Antenna yellowish, female AR about 0.88. Thoracic dorsal side with dark marking on yellowish ground color, scutellum with four bristles and few small setae. Wing with single large spot on middle part and several small spots on both basal and apical half. One spermatheca, very large and oval and one smaller and round; male hypopygium with pair of wedge-like sclerites and a pair of large, apically expanded parameres.

Male: Body about 1.2-1.33 mm. long. Wing about 0.95-1.0 mm. by 0.29-0.3 mm. Coloration mainly dull yellow, scutum, legs and wing with brownish or dark markings.

Head dull yellow, with eyes separated above as wide as three facets, mouthparts very pale brown, proboscis about one-third or one-fourth height of head capsule, clypeus with four to eight lateral setae. Maxillary palp rather slender, with segment 3 little shorter than 5 and sensory pore small, five segments in proportion of 7:8.3:11.5:7.3:13.3. Antenna with scape yellowish brown, following short basal segments and plumose hairs yellow, last three segments and neck part of 11 slightly brownish yellow; segments 2 to 10, 11 to 14, 2 to 11 and 12 to 14 together about 115.5:101.5 and 129.5:101 in proportion; distal eight segments about 9.8:9.8:9.8:9:14:29:31.5:35.3.

Thorax mainly dull yellow, scutum with dark, broad, median vitta between foveae, lateral parts dark, shoulder parts broadly yellow, caudoscuteal area with pair of large,

oblong, yellowish-white spots, dark spots and dark area of holotype reduced and of a paratype well developed; scutellum yellowish white, with median dark spot, four bristles and three or four small setae; postscutellum dark extensively and yellowish on lateral and anterior margins. Legs mainly pale brownish or slightly fuscous yellow, but all coxae and trochanters more brownish and hind leg with dark marking: Femur with basal spot, sub-basal and middle narrow bands and preapical spot, tibia with sub-basal constricted and apical spot, hind tarsal segment 1 dark at extreme base; claws small, equal, slightly bifid at apices and each with two minute teeth. Tarsal spurs: In fore and hind legs, segment 1 with a sub-basal and an apical, 2 and 3 each with apical; and in middle leg, 1 with two sub-basal and two apical and 2 to 3 each with two apical spurs; relative length of leg segments, except for basal two, about 120:116.5:64.5:27.5:20:15.5:17 in fore, 136.5:129.5:77.5:29.5:20:15.5:18 in middle, and 152:144.5:76:35:24:19:19.3 in hind leg.

Wing without macrotrichia, with large, irregular, dark spot at middle of wing which arises from costal margin, extends behind covering basal half of first radial cell,  $M_{1+2}$ , basal half of  $M_{3+4}$  and ends at tip of  $Cu_1$ , transverse spot at middle of narrow cell  $R_s$  narrow, arising from tip of  $R_s$  and ends at middle of  $M_1$ , several small dark spots: two in basal radial cell, one above middle part of stem of fMCu in cell  $M_2$ , one at base of anal lobe, one under end of  $Cu_2$ , one at apical quarter of cell  $M_1$ , one below apical third of  $M_2$  and one near caudal corner of cell  $M_2$ . Venation: Costa ending at basal 0.8 of wing length (61.5:75) and above middle point of anal margin of cell  $M_2$ ,  $R_s$  long and about three times as long as  $R_1$  (24:8.8), first radial cell rhombic, second radial cell long and about 1.8 times of first cell (14.8:8.3), relative length of  $R$ ,  $M$ , and stem of fMCu about 29.8:30.5:32, r-m not enveloped in middle dark spot and longer than first section of  $R_s$ , fMCu under end of r-m and its angle about 45 degrees,  $M_{3+4}$  not deflected from its stem and a little longer than twice of  $Cu_1$  (19:8.5). Haltere yellowish, but with apical margin and base of knob brownish.

Abdomen mainly white, but caudal segments gradually more brownish or brownish yellow. Hypopygium yellow, but styles, parameres, and aedeagus brown; sternite 9 with caudal margin slightly convex and with four bristles on caudal margin, tergite 9 about twice as long as sternite and tapered; coxites tapered, somewhat conical and not extending caudad beyond apex of tergite, styles slender, tapered, slightly arcuate and little shorter than coxites (22.5:28); aedeagus with two wedge-like strong sclerites as long as styles and each tip bifid into two sharply pointed apices; parameres large, as long as coxites, complex in shape, with basal one-third convergent, then strongly curved laterad, apical two-thirds divergent, gradually expanded, broadly truncate and apical ends turned dorsad.

*Female*: Body about 1.57 mm. long. Wing about 1.13 mm. by 0.37 mm. Coloration and structures very similar to those of male with usual sexual differences.

Head with proboscis about 0.4 as long as length of head capsule (9:22), clypeus with six lateral setae. Maxillary palp with sensory pore small, five segments in proportion of 5:10:13:8:12. Antenna entirely dull yellow, with basal short flagellar segments elongate and fully three times as long as width of swollen part, apical segment without distinct stylet; AR about 0.88; distal eight segments with relative length of 17:16.5:16.5:20:20:22.5:24.5:29.

Thorax similar to that of male in coloration. Legs also very closely similar in color to those of male; fore and middle legs with claws equally little shorter than last tarsal segments (23:29 in fore and 22:26 in middle) but hind leg with claws longer than last segment (27:20); all claws with pair of minute basal teeth and equal; last tarsal segments of fore and middle legs somewhat swollen ventrad on their sub-basal parts, but that of hind leg quite cylindrical. Tarsal spurs: In fore leg, segment 1 with sub-basal and apical, 2 to 4 each with apical; in middle leg, 1 with two sub-basal and two apical, 2 to 3 each with two apical and 4 with apical; in hind leg, 1 to 3 as in fore leg but 4 with two apical; hind tibia with apical comb of six bristles. Leg segments with following proportional length; 137:125:74:33:20:14:29 in fore, 133:152:86:32:18:13:26 in middle, and 179:174:92:40:25:22:20 in hind leg.

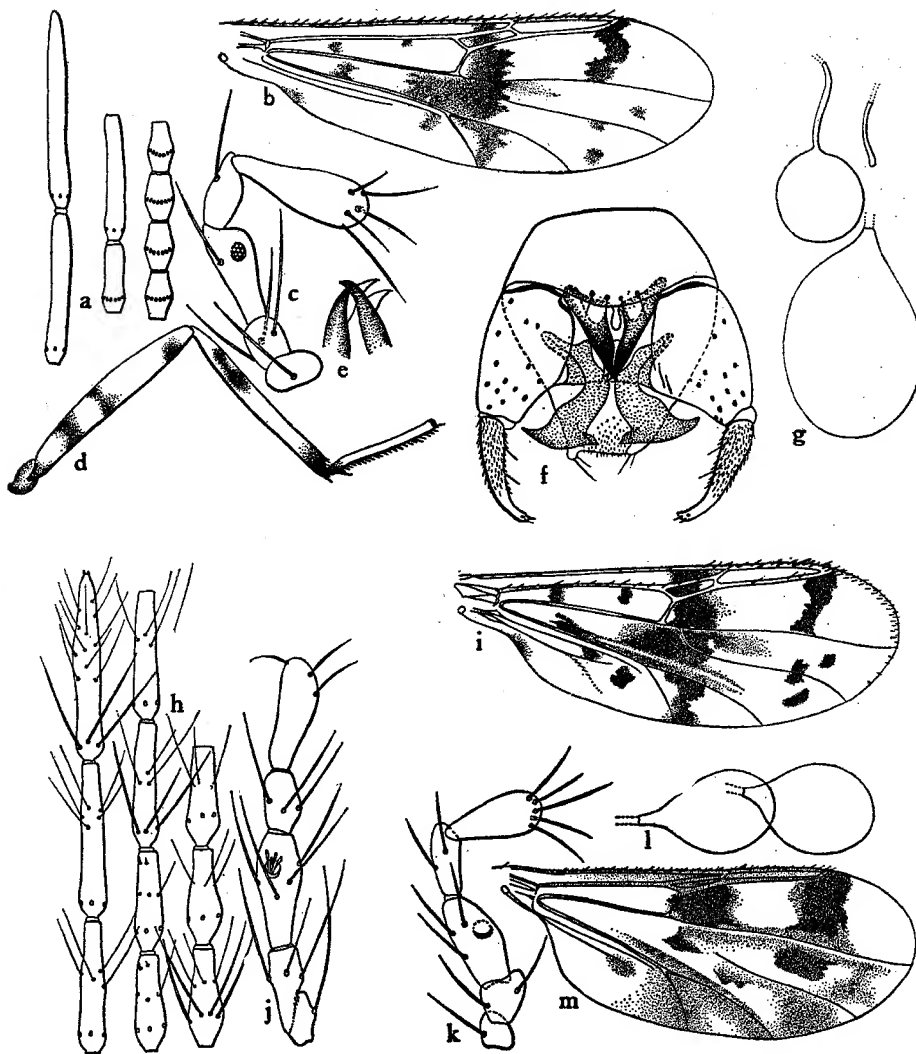


FIGURE 93.—a-j, *Monohalea palauensis*: a, distal eight antennal segments, male; b, wing, male; c, maxillary palp, male; d, segments of hind leg from trochanter to tarsal segment 1, male; e, caudal end of aedeagus, male; f, hypopygium, male; g, spermathecae, female; h, distal ten antennal segments, female; i, wing, female; j, maxillary palp, female. k-m, *M. mcdanieli*, female: k, maxillary palp; l, spermathecae; m, wing.

Wing with very sparse macrotrichia closely along apical margins of cells  $R_s$  and  $M_1$ , marking as in male, but small spot covering apical one-third of vein  $M_2$  extended into cells  $M_1$  and  $M_2$ . Venation: Costa ending slightly before level of tip of  $M_2$  and beyond basal 0.8 of wing length (72:87),  $R_s$  little shorter than three times  $R_1$  (31:11), second radial cell twice as long as first (20:10), r-m longer than basal section of  $R_s$  and as long as  $M_{1+2}$ , relative length of  $R$ ,  $M$ , and stem of fMCu about 33:34.5:34, fMCu slightly before level of end of r-m,  $M_{3+4}$  1.5 times as long as  $Cu_1$  (21:14) and not deflected from its stem. Haltere as in male.

Abdomen pale yellow, with caudal tip and cerci white. Three brown spermathecae, one very large, oval (2+22 by 16 units) and with minute neck part, one smaller, spherical (10 by 10 units) and with slender long neck part, one slender and tubular (6 by 1 unit).

Holotype, male (US 64620), Ngiwal, Babelthuap I., Palau Is., light trap, May 21, 1957, Sabrosky. Allotype, female (US), same locality as for holotype, May 20, 1957, Sabrosky. Paratypes, Palau: Male (BISHOP), Koror I., July 26, 1956, McDaniel; female, Ngiwal, Babelthuap I., May 19, 1957, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau).

This is allied to New Zealand *M. nubeculosa* Macfie in the wing marking. The allied species, however, is different in the following points from the present Micronesian species: The coloration is mainly dark brown; the wing has no small dark spot at apical one-third of basal radial cell, the costal vein ending at basal three-quarters of wing length much before level of tip of  $M_2$ ; the legs are very dark brown, with narrow pale-brown-yellow bands before and beyond knee joints; and the hind TR is about 2.0.

**136. *Monohalea mcdanieli* Tokunaga, n. sp. (fig. 93, *k-m*).**

Small, brown; wings with subconfluent, large, and ill-defined dark spots.

*Female*: Body about 1.14 mm. long. Wing about 0.74 mm. by 0.29 mm. Coloration generally brown, but legs with yellowish tarsal segments and abdomen paler.

Head pale brown, with eyes contiguous above and quite bare, mouthparts paler, proboscis about one-third as long as head capsule, clypeus with five setae on either lateral side. Maxillary palp stout, with segment 3 much longer than 2 and as long as 5, sensory pore small and situated just beyond middle of segment 3, five segments in proportion of 3:5:10.5:7:11.5. Antenna missing.

Thorax entirely brown, without pale or yellowish spots; scutellum with three strong bristles and three small median setae. Legs mainly brown, with tarsal segments yellow; fore and middle legs with knee joints somewhat paler; hind leg with extreme base of tibia also paler. Tarsal spurs: In fore leg, segment 1 with sub-basal and apical spur; in middle leg, 1 with sub-basal and two apical, 2 and 3 each with two apical; and in hind leg, 1 with sub-basal and apical, 2 with two apical spurs; fore and middle legs with claws small, simple, and equal and hind leg with claw single, large, and simple; relative length of leg segments, except for basal two, about 92:91:46:18:13:9:17 in fore, 102:91:48:18:11:8:15 in middle, and 124:110:45:26:16:17:16.5 in hind leg.

Wing without macrotrichia on membrane, with dark spots large, ill-defined, subconfluent, and forming two transverse bands: First band located at middle of wing, covering first radial cell, r-m, fMCu, and  $Cu_1$  and irregularly interrupted in cell  $M_2$ , second band located at apical quarter of wing, rising from tip of costa and ending on apical margin of cell  $M_2$ , irregularly interrupted in cell  $M_1$ , these two bands connected with each other by clouds along veins  $M_1$ ,  $M_2$ , and  $M_{3+4}$ . Venation: Costa ending slightly before tip of  $M_2$ , at basal 0.8 of wing length (44:57),  $R_s$  very long, about 2.5 times as long as  $R_1$  (20:8) and extending along costal margin, second radial cell about twice as long as first

(13:6.5), fMCu under end of r-m, stem of fMCu short and only slightly longer than R (22:18),  $M_{3+4}$  not deflected from its stem, about twice as long as  $Cu_1$  (17:9), and ending under middle of second radial cell. Haltere entirely white.

Abdomen with tergites mainly pale brown, but their lateral parts and caudal tergites more brownish, sternites paler, pleural sides fuscous, cerci white. Two spermathecae well developed, brown, oval, equal (2+12.5 by 9 units and 2+12 by 8.5 units), and each with short neck part.

*Male*: Unknown.

Holotype, female (BISHOP 2764), Koror I., Palau Is., June 24, 1956, McDaniel.

DISTRIBUTION: Caroline Is. (Palau).

This species is allied to *M. insularis* of Micronesia, but the allied species is distinctly different in the following two points: The basal radial cell of the wing has a median dark spot, and the scutum has yellowish-brown spots and many dark dots at bases of setae.

#### Genus *Palpomyia* Meigen (1818)

*Apogon* Rondani (1856), *Alasion* Rondani (1857) and *Heteromyia* Malloch (1915).

Body rather slender and almost bare. Eyes bare and usually well separated above. Female antenna with basal short flagellar segments oval and their verticils not very dense, five distal segments cylindrical and usually long. Male antenna with plumose hairs inconspicuous or practically absent. Maxillary palp slender. Scutum usually with small tubercle or spine in middle of frontal margin, surface almost uniformly covered with fine appressed pubescence. Femora with one or more stout or slender ventral spines, fore femur usually more or less thickened, but tibia slender, femora and tibiae of posterior legs slender; tarsal segment 4 cordiform or bilobed beneath and unarmed; tarsal segment 5 of female either unarmed or with curved spines below. Claws equal, rather well developed, with or without small sub-basal tooth on mesal side. Wing rather narrow, with fine microtrichia but without macrotrichia; costa extending at least two-thirds of wing length, two anterior radial cells well developed, second radial cell much longer than first, intercalary fork absent, median fork broadly sessile, anal vein bent near middle. Anal lobe not well developed. Abdomen of female nearly always with paired eversible glands arising between tergites 7 and 8 and often between other segments, these glands marked internally by slender rod-like projections pointed toward abdominal base. Male hypopygium partly or completely inverted, with styles simple and ending in apical tooth; aedeagus triangular or conical, often setigerous on ventral surface and crowned with hyaline cap-like lobe; parameres variably fused or separated and usually consisting of basal lateral arms and slender median caudal lobes.

#### 137. *Palpomyia sabroskyi* Tokunaga, n. sp. (fig. 94).

Large shiny black, with legs yellow and dark. Maxillary palp with scattered sensillae on ventral side of segment 3. Female antenna with AR about 1.8. Scutum with anterior spine, scutellum with four strong bristles and many small setae. Wing without macrotrichia. Haltere brown. Legs with two to five spines on all femora, tibiae dark on basal half and yellow on apical half, femora with apical and basal parts more or less dark and middle part yellow; in female last tarsal segments each with 12 spines on ventral side. Two spermathecae oval, large and subequal. Male hypopygium with aedeagus large and triangular, parameres long, with apical quarter turned, styles short, stout, and somewhat spindle-like.

*Female*: Body about 3.2 mm. long. Wing about 2.42 mm. by 0.7 mm.



Head entirely dark brown, with eyes very narrowly separated above, proboscis about one-third as long as height of head capsule, clypeus with about 12 marginal setae. Maxillary palp with scattered sensillae on ventral side of segment 3, five segments in proportion of 12:18:22:10:23.5. Antenna with scape yellowish brown, other segments mainly brown, but apical parts of all short basal segments yellowish brown, segment 2 as long as 3 to 4 together; AR about 1.8; proportional length of distal eight segments about 26:25:23:81:75:77:79:97, basal short flagellar segments at least three times as long as wide.

Thorax with one anterior scutal spine, mainly dark, but scutum somewhat brown on central part before caudoscuteal area and on lateral parts behind scutal sutures; scutellum with four strong bristles and about 12 small setae. Legs mainly black, apical halves of femora and basal two tarsal segments yellow, last three tarsal segments dark yellow, fore femur very broadly yellow on middle part, middle femur yellow on apical half except dark apical end, hind femur yellow on preapical one-third; all femora with ventral spines

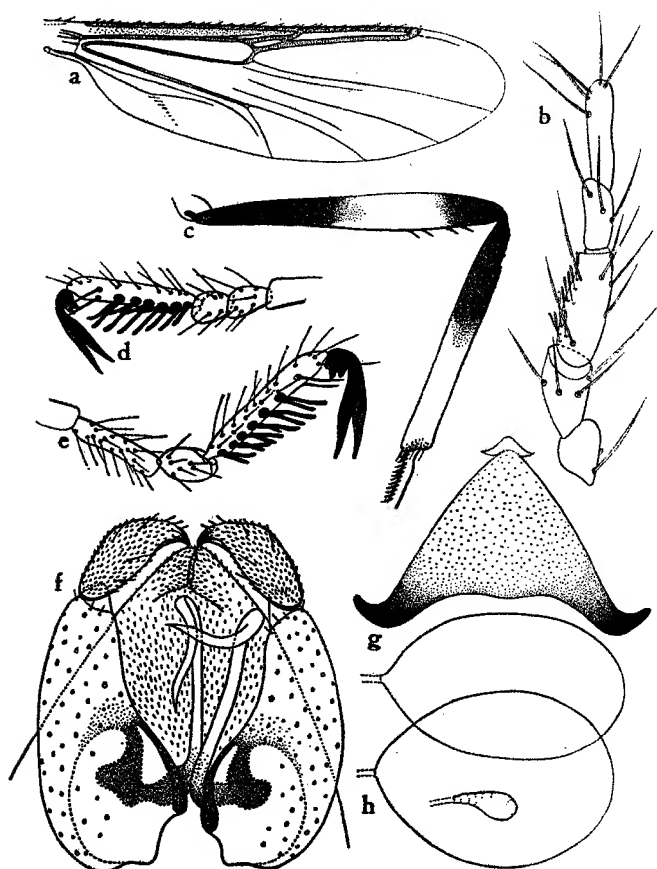


FIGURE 94.—*Palpomyia sabroskyi*: a, wing, female; b, maxillary palp, female; c, hind femur and tibia, female; d, distal three tarsal segments of fore leg, female; e, distal three tarsal segments of hind leg, female; f, hypopygium, male; g, aedeagus; h, spermathecae.

on apical part (three to five spines on fore leg, two or three on middle and two to four on hind leg), middle tibia with apical spine, hind tibia with apical comb of six bristles, last tarsal segments of all legs each with 12 strong spines on ventral side and two strong setae on preapical part of ventral side. Tarsal apical spurs: Fore leg without spurs; in middle leg, segment 1 with one, 2 to 3 each with two; and in hind leg, 2 and 3 each with one; tarsal segments 3 of fore and middle legs subobcordate, but in hind leg cylindrical, segments 4 all obcordate, claws equal, far shorter than segment 5 (42:64 in fore, 40:62 in middle, and 47:68 in hind leg) and each with small basal tooth. Leg segments, except for basal two, about 270:245:116:49:23:19:64 in fore, 326:263:167:53:24:20:62 in middle, and 395:330:233:83:43:24:68 in hind leg in relative length.

Wing hyaline, without macrotrichia on membrane and veins, with veins dark. Venation: Costa ending at basal 0.8 of wing length (153:186) and slightly before tip of  $M_2$ ,  $R_s$  about three times as long as  $R_1$  (67:22), second radial cell about 3.8 times as long as first cell (53:14), relative length of  $R$ ,  $M$ , and stem of  $fMCu$  about 70:73.5:76,  $fMCu$  under base of first radial cell,  $M_{3+4}$  ending under apical one-third of second radial cell and not deflected from its stem,  $Cu_1$  ending under apical end of first radial cell. Haltere black.

Abdomen with tergites dark brown, sternites reduced into small simple median sclerites and almost hyaline, but last two sternites well developed and brown, without tergal rods of eversible glands; two brown spermathecae, very large, oval, subequal (57 by 40 units and 57 by 37 units), one small, suboval (14 by 6.5 units) and with neck part.

*Male*: Unknown, but hypopygium attached to the end of female abdomen as follows: Tergite 9 subtriangular and tapered caudad; sternite 9 transverse, very narrow and with caudal emargination very shallow and wide; coxites rather slender, but swollen basally, tapered and about 2.2 times as long as basal width; styles small, about 0.46 as long as coxites (29:63), thickened at middle, pointed and curved on apical one-fifth and entirely pubescent; aedeagus triangular, half as long as basal width (35:70), and its basal arch low, about a quarter of total length and with hat-like apical projection; parameres slender, with basal quarter thickened, and extended transverse, middle part extending caudad and apical quarter strongly curved backward or laterad and ending in sharp points.

Holotype, female (US 64621), Ngwal, Babelthuap I., Palau Is., June 3, 1957, Sabrosky. Allotype, male (US), hypopygium attached to a female, Ngarsung, Airai, Babelthuap I., Palau Is., May 16, 1957, Sabrosky. Paratypes, Palau: Female, Ngerhelong Pen., Babelthuap I., May 3, 1957, Sabrosky; three females, Airai, Babelthuap I., light trap, May 6, 1957, Sabrosky; female, Ngardmau, Babelthuap I., May 10, 1957, Sabrosky. Yap: Female, Ruul, near Kolonia, Yap I., June 13, 1957, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau, Yap).

This is allied to the European *P. quadrispinosa* Meigen. However, the allied species is quite different in the following points: The female abdomen has three pairs of gland-rods; the second radial cell of the female wing is only 2.5 times as long as the first cell; the middle and hind femora are dark on distal parts more than half length and the hind tibia is dark at the distal end.

#### Genus *Sphaeromias* Curtis (1829)

*Xylocrypta* Kieffer (1899). *Schizodactylus* Ingram and Macfie (1921) and *Ankistrodactylus* Ingram and Macfie (1922).

Largely as in *Palpomyia*, but body stouter and more robust and with the following exceptions: Eyes nearly touching; antenna often very short and nearly bare, even male

devoid of plumose hairs; scutum without anterior tubercle. Femora with spines usually more numerous but smaller and inconspicuous; tarsal segment 4 usually short and always cylindrical, not distinctly cordiform or bilobed apically; tarsal segment 5 of female armed with strong spines or *bâtonnets* beneath; female claws large, almost equal, and often with basal tooth; fringe of hind margin of wing continued along poorly developed alula as far as squama; costa and Rs of female wing sometimes reaching almost to tip of wing (in male much shorter); and female abdomen without eversible glands or internal sclerotized rods.

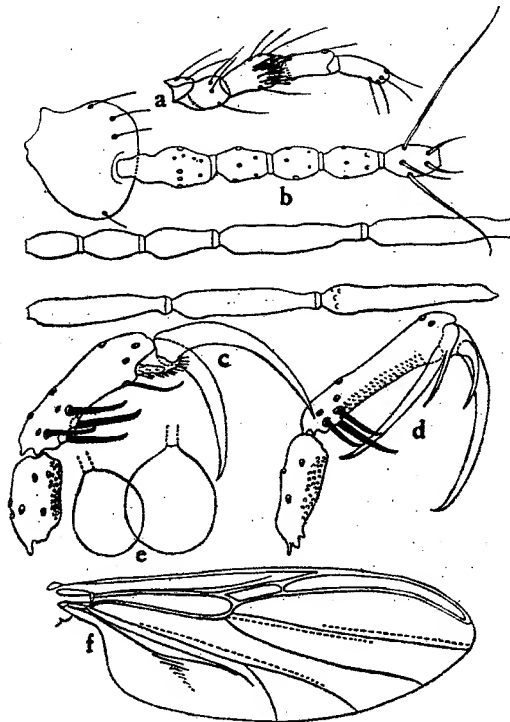


FIGURE 95.—*Sphaeromias kraussi*, female: a, maxillary palp; b, antenna; c, last two segments of hind leg; d, last two segments of fore leg; e, spermathecae; f, wing.

**138. *Sphaeromias kraussi* Tokunaga, n. sp. (fig. 95).**

Rather large, black and yellow. In dry specimen, scutum with brown pruinosity and scutellum and lateral sides of thorax with white pruinosity. AR of female about 1.47. Thorax entirely black, with setae small and pale brown, anterior tubercle of scutum indistinct. Legs of female mainly dark brown, but basal four tarsal segments of all legs yellowish white; all femora with five minute spines on preapical one-third of ventral side; claws almost symmetrical, those of fore leg each with slender basal tooth, but those of posterior two pairs simple; tarsal segment 4 cylindrical, tarsal segment 5 with three strong basal spines on fore leg and four on posterior two pairs. Wing white, broad, with veins very pale, costa almost reaching tip of wing, macrotrichia absent. Abdomen of female almost entirely white, except for dark posterior end; two spermathecae, spherical and unequal.

*Female:* Body about 2.6 mm. long. Wing about 1.95 mm. by 0.79 mm.

Head dark, with eyes very narrowly separated above, proboscis short, broad and about one-third height of head capsule, mouthparts brownish yellow, clypeus with about 20 small setae. Maxillary palp very pale, but segment 1 brown, with distal three segments cylindrical, segment 3 with sensillae on apical part, five segments in proportion of 7:15:17:15:13. Antenna brown and dark brown, basal flagellar segments, including scape, brown, but segments 6 to 9 more brownish on apical half than basal half, distal five segments dark brown, but their bases paler, being brown; AR about 1.47; relative length of distal ten segments about 14:14:14:15:18.5:37:36:37.5:37:45.5.

Thorax entirely dark, scutum without distinct anterior tubercle and with setae small and pale brown. In dry specimen, lateral sides of thorax and scutellum white-pruinose and scutum brown-pruinose. Scutellum with at least 15 pale setae. Legs with coxae, trochanters, femora, tibiae, and last tarsal segments black or dark brown, basal four tarsal segments yellowish white, but their apical ends more or less brownish. All femora with five small black spines on preapical one-third, tarsal segment 4 cylindrical; tarsal segment 5 of fore leg with three basal strong spines on ventral side; in middle leg, tibia with an apical strong spine, basal three tarsal segments each with two similar apical spines, last tarsal segment with four basal strong spines; in hind leg, tarsal segment 3 with two apical strong spines and last segment with four basal spines as in middle leg; claws almost symmetrical, large; in fore leg claws almost as long as last segment (51.5:54) and each with small mesal tooth; in middle and hind leg claws simple, at least as long as last tarsal segment (46:45 in middle and 51:47 in hind leg); hind TR about 2.25 and tibial comb with ten apical bristles. Relative length of leg segments, except for basal two, about 294:287:140:73:37:30:54 in fore, 295:225:128:55:31:25:45 in middle, and 316:232:148:65:30:22:47 in hind leg.

Wing broad, white, with anterior veins pale yellow and other veins very obscure, no macrotrichia. Venation: Length of R, M, and stem of fMCu about 54:58:70, Rs very long, curving along costal margin and about 2.7 times as long as R<sub>1</sub> (117:43), second radial cell little longer than three times first cell (79:24), r-m as long as distance between bases of M<sub>1</sub> and M<sub>2</sub> and about half as long as basal section of Rs, M<sub>3+4</sub> little shorter than twice of Cu<sub>1</sub> (50:27), fMCu slightly beyond level of r-m and its inner angle about 40 degrees. Haltere with stem pale brownish yellow and knob white.

Abdomen almost entirely white, with pleural membranes very pale fuscous, tergite 1 very pale brown, posterior segments 8 and following, including cerci, black. Two spermathecae, dark, subspherical, 29 by 23 units and 23 by 18.5 units and without chitinized part of duct.

*Male:* Unknown.

Holotype, female (BISHOP 2765), Inarajan, Guam I., Mariana Is., Oct. 1957, Krauss. Paratype, female, with type.

DISTRIBUTION: S. Mariana Is. (Guam).

This species is allied to Formosan *S. conjuncta* Kieffer, but this allied species is distinctly different from the new species in the possession of tarsal claws which are distinctly bifid.

#### Genus *Bezzia* Kieffer (1899)

*Probezzia* Kieffer (1906), *Pseudobezzia* Malloch (1915), *Parabezzia* Malloch (1915), *Allobezzia* Kieffer (1917), *Dicrobezzia* Kieffer (1919), and *Lasio-bezzia* Kieffer (1925).

Body slender, with sparse bristles on thoracic notum. Eyes bare. Antenna of female with basal segments oval or very short, five distal segments long and cylindrical; in male, usually with plumose hairs on segments 2 to 10 or 2 to 11 and four or five distal

segments cylindrical and elongate in various degrees, differing from preceding flagellar segments. Maxillary palp slender. Mesonotum without trace of anterior spine or tubercle; scutum with several strong supraalar and postalar bristles; scutellum usually with several strong bristles and various number of small setae. Some femora usually with one or more short, stout ventral spines; fore femora more or less swollen; tarsal segment 4 short, cordiform, and without spurs; tarsal segment 5 cylindrical and with or without ventral spurs; claws moderate, equal, with or without small basal tooth; empodium absent. Wing narrow, with fine microtrichia and usually without macrotrichia of membrane. Venation: Only one anterior radial cell,  $R_1$  and  $R_s$  quite separated, costa extending at least two-thirds of wing, no intercalary fork, median fork usually sessile and occasionally with short petiole, cross vein r-m vertical or nearly so, anal vein bent at middle and with fold arising from bend; anal lobe not well developed. Abdomen of female nearly always with paired eversible glands arising between tergites 6 and 7 and often between other segments, these marked internally by slender, sclerotized rod-like projections pointing toward base of abdomen. Male hypopygium inverted; tergite 9 rather small, with cerci well developed; coxite simple; style simple and each with apical tooth; aedeagus more or less triangular or conical; parameres fused, forming elongate lobe.

In Tokunaga's report (1939, *Tenthredo* 2: 273-313), *Nilobezzia* Kieffer, *Parrotia* Kieffer, and *Crespinia* Kieffer were included in the *Bezzia* group. However, we consider these three as independent groups separated from the genus *Bezzia*, all with normal cylindrical fifth tarsal segments in all legs. The genus *Bezzia* may be subdivided into the following four subgenera: *Bezzia*, *s. str.*, *Probezzia*, *Lasiobezzia*, and *Parabezzia*. *Pseudobezzia* and *Allobezzia* are identical with *Bezzia*, *s. str.*, and *Dicrobezzia* with *Probezzia*.

#### KEY TO MICRONESIAN SPECIES OF BEZZIA

1. Femora and tibiae of all legs largely dark brown or brown..... 2  
     At least one segment of legs largely yellowish or pale brownish..... 5
- 2(1). Fore leg without distinct yellowish or pale bands before and beyond knee joint ..... 3  
     Fore leg with distinct pale-brown or yellowish bands before and beyond knee joint ..... 4
- 3(2). All tibiae somewhat paler sub-basally; male paramere much longer than aedeagus and coxite of hypopygium rather short and thickened; female inner abdominal rods of tergite 7 very short, not beyond preceding tergite; spermathecae round and with rather long chitinized ducts.....139. *adamsi*  
     Middle and hind tibiae uniformly dark brown; male paramere slightly longer than aedeagus and coxite of hypopygium rather slender; female inner abdominal rods of tergite 7 very long, extending into segment 4; spermathecae oval and with short chitinized ducts.....140. *badiifemorata*
- 4(2). Fore femur with four to six spines; hind tibia with four to five strong bristles on extensor side; scutellum with three pairs of rather long bristles .....141. *spinositibialis*  
     Fore femur with only two spines; hind tibia with many rather strong bristles on extensor side; scutellum with two pairs of long bristles .....142. *clarkei*
- 5(1). Wing with alula dark.....146. *nigrialula*  
     Wing with alula pale, similar in color to membrane..... 6

- 6(5). Middle and hind femora almost entirely dark brown.....143. *maculifemorata*  
 Middle and hind femora largely yellowish or pale brownish..... 7
- 7(6). Abdomen almost uniformly very pale, being mainly dull white.....147. *nigrofasciata*  
 Abdomen with tergites uniformly dark brown or brown..... 8
- 8(7). Hind femur with dark-brown basal area, similar in color to hind coxae  
 and trochanter; middle and hind femora distinctly dark brown on distal  
 areas .....144. *sulfureicruris*  
 Hind femur without dark-brown basal area; middle and hind femora en-  
 tirely yellow and without dark-brown distal areas.....145. *pediaureola*

**139. *Bezzia adamsi* Tokunaga and Murachi, n. sp. (fig. 96, a).**

Medium-size, dark-brown; scutellum with four strong bristles and many minute accessory setae; legs brownish, with many obscure bands or rings; fore femur with nine or ten ventral spines. Male hypopygium closely similar to that of *B. badiifemorata*; female with abdominal rods of tergite 8 short, not beyond tergite 7 and two spermathecae subequal, round, with slender, curved chitinized ducts.

*Male*: Body length about 2.44 mm. Wing about 1.43 mm. by 0.39 mm.

Head almost entirely dark brown, with eyes just contiguous above. Maxillary palp with five segments in proportion of 5:10:16:10:13; clypeus with about nine setae. Antenna with scape dark brown, flagellum including plumose hairs brown (distal segments broken).

Thorax uniformly dark brown; scutellum with four long bristles and about 20 minute accessory setae. Legs with coxae brown, trochanters and basal parts of femora pale brown, knee joints dark brown. Other segments somewhat different in coloration. In fore leg, femur broadly brown on middle three-fifths, but obscurely paler at middle one-fifth and both ends pale brown, with about nine ventral spines arranged in line on entire length, tibia pale brown, but both end parts brown, three basal tarsal segments yellowish brown, but their distal ends brown, two distal segments all brown. In middle leg, femur pale brown on basal part and brown on apical half or more, tibia mainly brown, but base narrowly pale brown, tarsal segments similar to those of fore leg. In hind leg, femur and tibia as in middle leg, tarsal segment 1 almost entirely brown, except for pale-brown base, other four tarsal segments as in fore leg; claws slightly bifid at tip; leg segments, except for basal two, in proportion of 166:146:63:33:19.5:15:26 in fore leg, 199:163:95:43:20.5:15:24 in middle leg, and 242:218:131:51:22:15:30 in hind leg.

Wing slightly fuscous on distal part of radial cell. Venation: Costa just produced beyond tip of Rs, about 0.72 of wing (80.5:30), Rs much shorter than R (35:41) and almost straight, stem of fMCu longer than R (48:41), fMCu just beyond origin of r-m, tip of Cu<sub>1</sub> under tip of R<sub>1</sub>, tip of M<sub>3+4</sub> at level of tip of costa. Haltere with stem brown and knob pale yellow.

Abdomen slightly pale brown. Hypopygium dark brown, closely similar to that of *B. badiifemorata*; coxite rather stouter than in allied species, slightly longer than basal width (27.5:22.5); style much shorter than coxite (21:27.5); aedeagus somewhat Y-shape, basal arch somewhat lunate, median part shorter than basal width between two basal points (22:25); paramere longer than aedeagus (29:22) and about 1.5 as long as basal width between lateral tips, basal arch also lunate.

*Female*: Body about 2.82 mm. long. Wing about 1.74 mm. by 0.55 mm. Coloration generally as in male.

Head with eyes narrowly separated above, vertex dark brown, frons and mouthparts brown; clypeus with about 12 setae. Maxillary palp with five segments in proportion of 7:14:18:10:14.5. Antenna with scape dark brown (flagellum broken).

Thorax as in male. Legs mainly brown, but tarsal segments brown and brownish white; in fore leg, coxae and trochanters brown, femur pale brown at extreme base, mainly brown, with obscure darker preapical band and about ten ventral spines, tibia

mainly brown, with both ends dark brown and with more brownish median band, three basal tarsal segments brownish white and their ends brown, two distal segments entirely brown; in middle and hind legs, from coxae to femora almost entirely brown, except for pale-brown extreme bases of femora, tibiae dark brown at extreme bases, pale-brown sub-basal areas and other parts broadly brown, tarsal segments as in fore leg; claws equal, each provided with minute sub-basal tooth; leg segments in proportion of 187:158:67:35:18:18:35 in fore leg, 228:182:96:45:23:17: ? in middle leg, and 273:235:145:56:27:20:42 in hind leg.

Wing with costal and radial veins fuscous. Venation: Costa almost 0.8 as long as wing (115:134) and very slightly produced beyond tip of  $R_s$ ,  $R_s$  slightly curved along costal margin, proportion of  $R$ ,  $R_1$ ,  $R_s$ , and stem of  $fMCu$  about 45:23:51:55,  $M_{1+2}$  very short and half as long as  $r-m$ ,  $fMCu$  a little beyond origin of  $r-m$ , tip of  $R_1$  a little beyond level of tip of  $Cu_1$ , tip of  $M_{3+4}$  a little before tip of  $R_s$ . Haltere as in male.

Abdomen uniformly pale brown; cerci brown; rods of tergite 7 very short and not beyond tergite 7; two brown spermathecae, round, subequal, about 12.5 by 12+6.5 units and 11 by 11+5 units, with slender, curved chitinized ducts; one spermatheca vestigial, brown, 4.5 by 2.5 units.

Holotype, male (US 64061), Ponape, airfield, June-Sept. 1950, Adams. Allotype, female (BISHOP 2602), Mt. Dolotomw, Ponape, June-Sept. 1950, Adams.

Other specimen, male, Mt. Temwetemwensekir, Ponape, Mar. 22, 1948, Dybas.

DISTRIBUTION: Caroline Is. (Ponape).

This species is closely allied to *B. badiifemorata*, but in *adamsi* all tibiae are sub-basally paler, the paramere of the male hypopygium is much longer than the aedeagus, the coxites are rather shorter and thicker, the internal abdominal rods of female are very short, and the spermathecae are round and provided with rather long chitinized ducts, while in *badiifemorata*, the middle and hind tibiae are uniformly dark brown, the paramere of the male hypopygium is slightly longer than the aedeagus, the coxites are rather slender, the internal abdominal rods are long, and the spermathecae are oval and provided with short chitinized ducts.

#### 140. *Bezzia badiifemorata* Tokunaga and Murachi, n. sp. (fig. 96, b).

Rather large, dark; in dry state, scutum not strongly shining, black on median area, brownish pruinose on lateral areas and grayish or whitish pruinose on humeral areas; in mounted state, scutum uniformly dark brown or brown on lateral areas and dark on mesal area. Legs mainly dark or brown, except for yellowish to pale-brown tarsal segments; fore tibia with pale-brown sub-basal ring. Abdomen uniformly dark brown to brown including terminal appendages.

*Male*: Body length 3.4-3.6 mm. Wing 1.8-2.1 mm. by 0.45-0.52 mm.

Head brown including mouthparts. Eyes separated above as wide as diameter of facet. Maxillary palp with segments in proportion of 8:12:20.8:14:16.8. Antenna including plumose hairs almost entirely brown, but basal swollen parts of flagellar segments somewhat paler; eight distal segments in proportion of 19.5:23:29.3:36:36:40:54.5:65.5; segments 2 to 8, 2 to 9, 2 to 10, 9 to 14, 10 to 14, and 11 to 14 about 41.8:49.5:57.5:53.5:46.5:42.5.

Thorax in mounted specimen entirely brown. Scutellum with two pairs of distinct bristles and many minute setae. Legs with coxae to tibiae brown, but knee joints and

tibial ends dark brown and fore tibia with pale-brown sub-basal ring, obscure in young adult; tarsal segments mainly pale brown to pale yellowish brown; fore femur armed with seven or eight strong spines on entire length of flexor side and two or three small spines on apical part; in fore leg, tibia and tarsal segments without spurs or tarsal segment 2 and 3 with apical spur; in middle leg, tibia and three basal tarsal segments each with two distinct apical spurs, but, in one paratype, tarsal segment 2 and 3 with single spur; in hind leg, femur and tibia each without or with single apical spur and two basal tarsal segments each with apical spur, but, in a paratype, 2 with two and 3 with one spur; claws small, symmetrically bifid at extreme tips. Leg segments from femora to tarsal segment 5 in proportion of 43:33.5:13.5:7.3:4.8:4:7.8 in fore leg and 56.5:47:27:13.3:6.5:4.5:8 in hind leg.

Wing with membrane pale brown, but costal area brown, and anterior veins brown. Venation: Forking point between  $M_1$  and  $M_2$  at end of r-m,  $R_1$  slightly shorter than one-half of  $R_s$  (21:37.5) and ending at level of tip of  $Cu_1$ , fMCu far beyond r-m,  $R_s$  ending above tip of  $M_{2+3}$ . Haltere white or slightly brownish.

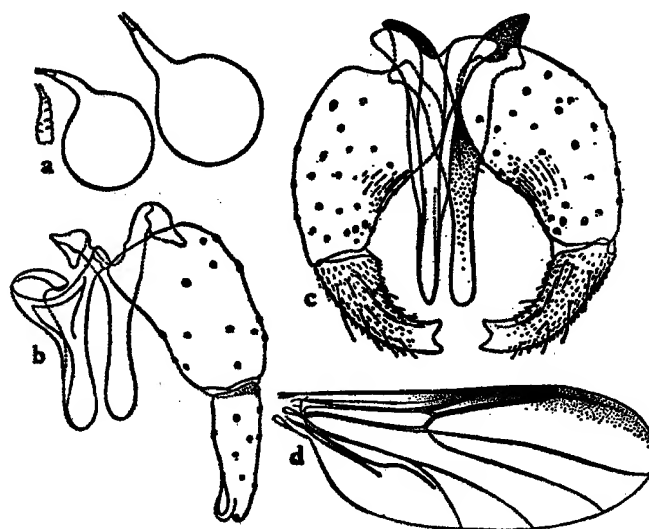


FIGURE 96.—a, *Bezzia adamsi*, spermathecae. b, *B. badiifemorata*, hypopygium (tergites and sternites omitted), male. c, d, *B. spinositibialis*: c, hypopygium, male; d, wing, female.

Abdomen uniformly brown. Hypopygium closely similar to that of *Bezzia sulfureicruris*; but parameres much shorter, only slightly longer than aedeagus, basal arms slender.

*Female*: Body 3.63-4.16 mm. long. Wing 1.81-2.44 mm. by 0.45-0.66 mm. Specific characters mainly as in male with usual sexual differences.

Head with maxillary palp five-segmented in proportion of 9.3:12.5:15.5:10.8:14.7. Antenna mainly brown, but basal halves of segments 2 to 9 and basal swollen parts of segments 10 to 14 white or paler. AR 1.39-1.40; flagellar segments 8 to 14 in proportion of 15.8:16.3:35.9:35.5:33:41:40.5; two distal segments subequal in length and distinctly longer than either of preceding segments.

Thorax uniformly dark brown; scutellum with two pairs of distinct bristles and many small setae. Leg segments from femora to tarsal segments 5 in proportion of 43:33.5:13.5:7.3:4.8:4:7.8 in fore leg and 56.6:47:27:13.3:6.5:4.5:8 in hind leg.



Wing with membrane and veins pale brown. Venation: fMCu just beyond origin of r-m, Rs ending far beyond tip of  $M_{2+4}$  and slightly longer than twice of  $R_1$  (50:23).

Abdomen uniformly brown, inner rods of tergite 7 reaching anterior margin of tergite 4; two spermathecae subspherical or oval, unequal, brown, with short brown neck parts; one reduced, minute, pyriform, and hyaline.

Holotype, female (US 64062), Mt. Kupwuriso, Ponape Island, June-Sept. 1950, Adams. Allotype, male (US), Mt. Dolen Nankep, Ponape, 518-549 m., Aug. 13, 1946, Townes. Paratypes, two males (BISHOP), same data as for holotype; female, same data as for allotype, 610 m.

DISTRIBUTION: Caroline Is. (Ponape).

The allotype seems to be a young adult male, the dark coloration not being fully developed and generally somewhat paler than the holotype. The female paratype from Mt. Dolen Nankep may also be a young adult, the general coloration being brown, the scutum with a dark cloud on the median part of the anterior two-thirds, and the tibiae mainly pale brown.

This species is somewhat similar in coloration to *B. separata* Kieffer, from Formosa but in *separata* Rs is far longer, about 2.5 as long as  $R_1$ , and the female AR is less than 1.0, differing from this species. The species name is related to the dark-brown color of all femora.

141. *Bezzia spinositibialis* Tokunaga and Murachi, n. sp. (fig. 96, c, d).

Dark-brown or black; scutum black and strongly shining, sometimes very slightly pruinose. Legs dark brown except for yellowish-brown tarsal segment; fore leg with yellowish-brown rings before and beyond knee joints; hind leg with four or five very strong bristles on extensor side of tibia. Abdomen mainly dark brown or brown, but in male tergites 2 to 4 yellowish, and in female tergite 2 yellowish.

*Male*: Body length 2.6-3.04 mm. Wing 1.5-1.61 mm. by 0.33-0.41 mm.

Head black or brown. Eyes separated as wide as two to two and a half facets on vertex. Mouthparts brown, with maxillary palp slender and five-segmented (7:10.3:14:11.5:10). Antenna with scape brown, plumose hairs yellow; segments 2 to 11 yellow, but segment 11 brown at tip; segments 12 to 14 brown but their bases yellow; segment 11 longest and subequal to, or slightly longer than, preceding two segments together; segments 11 to 14 subequal to, or slightly longer than, preceding segments 2 to 10 together; proportion of eight distal segments about 14:15:21.5:31.5:55.8:31.5:41.3:48.

Thorax black or dark brown; scutum black and strongly shining, but, in some specimens, very slightly pruinose brownish marking, pair of round spots at humeral pits in lateral aspect and three pairs of small spots along foveae in dorsal aspect, without tubercles. Scutellum with two or three pairs of strong setae and many small setae. Legs with coxae, trochanters, femora, and tibiae mainly dark brown, and tarsal segments yellowish brown, but fore legs with yellowish-brown rings before and beyond knee joints and tarsal segment 4 of all legs somewhat fuscous; in fore leg, femur with four to six strong, thorn-like bristles on apical three-fifths of flexor side and apical strong bristle, tibia with two or three apical spurs, tarsal segments without distinct spurs; in middle leg, femur and tibia with three or four apical spurs respectively, three basal tarsal segments each with two apical spurs; in hind leg, femur with three apical strong spines, tibia with four or five strong bristles on extensor side and apical spur, tarsal segment 1 with apical spur, but other tarsal segments without distinct spurs; claws small, symmetrical, and minutely bifid at tip. Proportion of leg segments 41.5:33.5:12:10:6:4:6.5 in fore leg, 51:38:24.5:11.5:6:4:6.5 in middle leg, 56:51:32:13:8:4.5:6.5 in hind leg.

Wing with anterior veins pale yellowish brown and membrane very slightly yellowish brown. Venation: fMCu just beyond origin of r-m, forking point between  $M_1$  and  $M_2$  at level of end of r-m,  $R_1$  ending at level of tip of  $Cu_1$ , Rs ending before level of tip of  $M_{2+4}$  and little shorter than twice of  $R_1$  (26:14). Haltere dark brown or brown.

Abdomen brown or dark brown, but tergites 2 to 4 yellowish. Hypopygium with coxite slightly swollen mesad at base, style far shorter than coxite, evenly curved, not distinctly narrowed, but somewhat truncate at tips, and angulate at two points of each apical tip; aedeagus much longer than coxite, slender, narrowed on apical one-third, and somewhat pointed; parameres united forming flat and slender plate, similar in shape and size to aedeagus but round at tip. In a male paratype from Ngerkabesang Island, Palau, the coloration of fore tibia is somewhat different, with a preapical yellowish ring as well as a sub-basal one.

*Female*: Body length 2.63-3.13 mm. Wing 1.31-1.55 mm. by 0.45-0.55 mm.

Head including mouthparts brown. Eyes separated above as wide as one and one-half facets. Antenna with scape brown, segments 2 to 9 pale brown or yellowish brown, segments 10 to 14 brown, but their basal parts paler. Proportion of eight distal segments about 13:13.5:14.3:26.5:28.5:29.5:31:38.8. AR 1.39-1.46.

Thorax dark brown; scutellum with three pairs of large bristles, but middle pair little smaller. In fore leg, femur with six thorn-like spines on flexor side, tibia without distinct apical spurs; in middle leg, femur with four strong apical bristles, tibia with three or four distinct apical spurs, three basal tarsal segments each with two apical spurs; in hind leg, femur with four or five distinct apical bristles, tibia with four strong bristles on extensor side and apical spur, tarsal spurs indistinct. Proportion of leg segments about 40:32:14.5:12:5.5:3:7 in fore leg, 50:38.5:21:9:5:3.5:6 in middle leg, and 59:47:25.5:11:6:3.5:7 in hind leg.

Wing fuscous on distal half of radial cell including marginal veins. Venation: fMCu under end of r-m, Rs ending slightly beyond tip of  $M_{2+4}$ , Rs little shorter than twice of  $R_1$  (29:15).

Abdomen brown, but tergite 2 yellowish; inner rods of abdominal tergite 7 extending cephalad and ending under tergite 2. Two spermathecae oval, brown, unequal, with short neck part. Other structure and coloration as in male except for usual sexual differences.

Holotype, male (US 64063), hill behind Yaptown, Yap, light trap, Nov. 29, 1952, Gressitt. Allotype, female (US), South Yap I., Yap, July-Aug. 1950, Goss. Paratypes:

Palau. Male, Gakip, Babelthuap, July 19, 1946, Townes; female, East Ngatpang, Babelthuap, Dec. 10, 1952, Gressitt; male, Ngerkabesang, July 18, 1946, Townes; male, Koror, May 1953, Beardsley; male, Koror, sweeping, Mar. 10, 1954, Beardsley; female, six males, southwest Koror, 25 m., light trap, Dec. 5-11, 1952, Gressitt.

Yap. Male (BISHOP), same data as for holotype; male, same data as for allotype; two males, Yap, Aug. 1952, Krauss.

#### Other specimens:

Palau. Female, Ngerehelong Pen., Babelthuap, May 8, 1957, Sabrosky; female, male, Ngiwal, Babelthuap, May 19-20, 1957, Sabrosky; two males, Airai, Babelthuap, May 16, 1957, Sabrosky; female, Koror, Dec. 21, 1947, Dybas; two females, six males, Apr. 18, female, Apr. 22, three females, four males, May 2, male, May 4, male, May 29, 1957, Koror, light trap, Sabrosky; two males, Ngerkabesang, May 13, 1957, Sabrosky.

Yap. Female, Dugor, June 6, 1957, Sabrosky; female, June 8, two females, June 13, 1957, Kolonia, Sabrosky; two females, Gagil Distr., June 19, 1957, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau, Yap).

This species is easily distinguished from other known species of the Pacific islands by the specific coloration of the legs and the distinctly setigerous hind legs. The species name is related to the strong bristles of the hind tibiae.

142. *Bezzia clarkei* Tokunaga and Murachi, n. sp. (fig. 97, a, b).

Black, shining, closely similar to *B. spinositibialis* in coloration, but abdominal tergite 2 uniformly brown, each spermatheca with long and slender duct and small blunt projection at bottom, scutellum with four strong bristles and many small accessory setae, fore femur with only two ventral and two preapical spines, and hind tibia setigerous with many setae on dorsal side, which are uniformly strong, all differing from the allied species.

*Female*: Body length about 2.27 mm. Wing about 1.13 mm. by 0.42 mm.

Head dark brown; eyes narrowly separated above. Maxillary palp with five segments in proportion of 6:7.5:14:10:10; segment 3 longest, with many scattered sensillae on distal half. Antenna broken.

Thorax uniformly dark brown and shining in dry state, but in mounted specimen scutum with large, somewhat brown, square spot on anterior half between foveae; scutellum with two pairs of strong bristles and many small accessory setae. Legs with coxae dark brown, trochanters pale brown, femora mainly dark brown, but femoral basal areas narrowly paler, fore femur with preapical paler ring, tibiae mainly dark brown, but fore tibia with sub-basal and apical paler ring, knee joint of fore leg black, tarsal segments yellowish white, but tarsal segments 4 and 5 of all legs more or less dark. Fore tibia with only two preapical ventral spines; middle tibia with apical spine on dorsal side and three basal tarsal segments each with two apical spurs; hind tibia setigerous on dorsal side with many strong bristles, which are all uniformly strong, and three basal tarsal segments with two rows of small spinules on ventral side; claws all small, equal, and simple. Proportion of leg segments, except for basal two, 130:120:51:25:18:13:22 in fore leg, 161:134:83:32:19:14:22 in middle leg, and 180:150:88:36:22:14:23 in hind leg.

Wing with fine microtrichia on membrane, without macrotrichia, almost colorless and hyaline, but dark on apical half of radial cell. Venation:  $R_s$  ending at basal seven-tenths of wing (61:87),  $R_1$  shorter than half of  $R_s$  (12:28),  $M_{1+2}$  forking just beyond end of r-m, base of  $M_2$  obscure, fMCu beyond r-m,  $R_1$  ending just before level of tip of  $Cu_1$ ,  $R_s$  ending at level of tip of  $M_{3+4}$ . Haltere dark brown.

Abdomen uniformly brown, somewhat constricted between segments 6 and 7; tergite 2 without yellowish spot; inner rods of tergite 7 extending cephalad and ending under tergite 2; cerci brown; two spermathecae brown, slightly unequal, with long and slender neck duct and blunt small projection at bottom.

*Male*: Unknown.

Holotype, female (US 64064), Pukusrik, Kusaie, Caroline Is., light trap, April 3, 1953, Clarke.

DISTRIBUTION: Caroline Is. (Kusaie).

This species is named in honor of Dr. J. F. G. Clarke who collected the midge. It is very closely allied to *B. spinositibialis*, but the two species are different from each other in the arrangement of strong bristles and small setae of the scutellum, the relative position of cross vein r-m and fMCu, the arrangement of ventral spines of the fore femora and of dorsal bristles of the hind tibiae, and the structure of the spermathecae.

**143. *Bezzia maculifemorata* Tokunaga and Murachi, n. sp. (fig. 97, c).**

Dark; middle and hind femora dark brown, fore femora pale brown and each with two dark-brown rings, all tibiae yellowish brown or pale brown.

*Male*: Body about 3.4 mm. long. Wing about 1.55 mm. by 0.45 mm.

Head dark brown. Eyes separated above as wide as one and one-half facets. Maxillary palp five-segmented, 6.5:10.5:14.5:12.8:14. Antenna with scape brown, segments 2 to 10 pale brown, 11 to 14 brown, but bases of all flagellar segments very pale and almost hyaline; plumose hairs pale brown; proportion of eight distal segments about 5:5:6.5:8.5:7:8:11:11; segments 2 to 8, 2 to 9, 2 to 10, 9 to 14, 10 to 14, and 11 to 14 in proportion of 33.5:40:48:50.5:44:35.

Thorax dark brown to black; in dry state, humeral areas grayish pruinose, but in mounted state pale yellowish brown; scutellum with two pairs of distinct bristles. Legs dark brown to pale yellowish brown; in fore leg coxa dark brown, trochanter and femur pale brown, but knee joints dark and femur with two dark-brown rings, tibia pale brown and dark or dark brown at both ends, tarsal segments pale yellowish brown, but distal ends of each segment and segment 3 to 5 somewhat more brownish; in middle leg, femur almost entirely dark brown, tibia and tarsal segments mainly yellowish brown, coloration of other parts as in fore leg; in hind leg, coxa, trochanter, and femur entirely dark brown, other parts as in middle leg. In fore leg, femur with about ten thorn-like spines on flexor side; in middle leg, tibia with two strong apical spurs, two basal tarsal segments each with two apical spurs; in hind leg, three basal tarsal segments each with two apical spurs; leg segments from femora to tarsi in proportion of 41:33:15:8:4:3:4.5 in fore leg, 50:40:24:11:6:4:5.5 in middle leg, and 60:63:35:16:7.5:4.5:8 in hind leg.

Wing with membrane and anterior veins pale brown. Venation: fMCu beyond r-m, Rs a little longer than twice of  $R_1$  (32:15). Haltere white.

Abdomen with tergites uniformly dark brown. Hypopygium dark brown; sternite 9 with large semicircular incision at caudal margin; coxite and style rather small, subequal in length, style slightly curved at tips and each with shallow concavity on flexor side at tip. Aedeagus much shorter than parameres, its basal arms pointed at tips and basal margin shallowly and evenly concave, median part extending caudad forming flat lobe, which is parallel at side and ends in round tip; fused parameres slender, its basal margin deeply concave, median lobe clavate and ending in round tip; ultimate tergite with large V-shape incision at caudal margin; cerci produced caudad.

*Female*: Body length about 3.5 mm. Wing about 1.77 mm. by 0.5 mm.

Head with eyes separated above as wide as a facet. Maxillary palp five-segmented (8:12:17:11:14). Antenna mainly brown; basal swollen parts of all flagellar segments paler; AR about 1.45; eight distal segments in proportion of 14.5:15.5:17:36:34.5:31:36:40.5.

Thoracic scutellum with two pairs of strong setae. Femur of fore leg with eight or nine strong spines; middle tibia with apical spur; coloration slightly different from that of male: Fore trochanter dark brown, middle femur pale brown on basal half and middle trochanter pale brown. Proportion of leg segments 40:33:12:7:5:4:7 in fore leg, 47:37:22:8.5:4.5:4:7 in middle leg, and 60:50:32:12.5:6:5:8.5 in hind leg.

Wing venation: fMCu just beyond origin of r-m, forking point between  $M_1$  and  $M_2$  under end of r-m,  $R_1$  ending at level of tip of  $Cu_1$ , Rs longer than twice of  $R_1$  (39:16) and ending far beyond tip of  $M_{3+4}$ .

Abdomen with tergites uniformly brown, inner rods of tergite 7 ending under middle of tergite 3. Two spermathecae brown, round, unequal, with long chitinized neck part. Other structures generally as in male with usual sexual differences.

Holotype, male (US 64065), Colonia, Ponape, Aug. 9, 1946, Townes. Allotype, female (US), same data as for holotype. Paratypes, Palau: Female, Koror, Sept. 1952, Krauss; female, Koror, Sept. 16, 1952, Beardsley; female (BISHOP), southwest Koror, 25 m., light trap, Dec. 11, 1952, Gressitt.

Ponape: Female, male, Mt. Dolen Nankep, Aug. 9, 1946, Townes; male, air-field, June-Sept. 1950, Adams; three females, Colonia, Aug. 8, 1946, Townes.

DISTRIBUTION: Caroline Is. (Palau, Ponape).

This species is allied to Formosan *B. separata* Kieffer, but in the allied species, the female AR is less than 1, the femur of the fore leg has only three spines, and fMCu is far beyond the level of r-m. The species name is related to the marking of the fore femora.

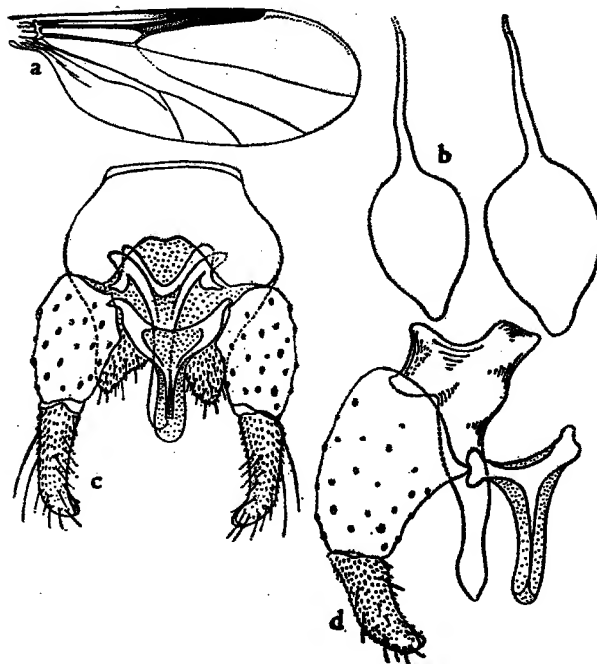


FIGURE 97.—a, b, *Bezzia clarkei*: a, wing, female; b, spermathecae. c, *B. maculifemorata*, hypopygium, male. d, *B. sulfureicruris*, hypopygium (tergites and sternites omitted), male.

144. *Bezzia sulfureicruris* Tokunaga and Murachi, n. sp. (fig. 97, d).

Dark; head, thorax, and abdomen black to dark brown, but legs mainly yellowish. Thoracic scutum black and shining, with small white pruinose pattern at humeral areas; scutellum black and with three pairs of strong bristles; abdomen almost entirely dark brown; legs with coxae and trochanters dark brown, other segments mainly yellow to pale brown.

*Male*: Body about 2 mm. long. Wing about 1.83 mm. by 0.44 mm.

Head black on vertex, other parts including mouthparts dark brown. Eyes separated above as wide as two facets. Maxillary palp five-segmented (7:10.5:12:10:10.5). Antenna with scape brown; other segments broken.

Thorax dark and shining; scutum with small white pruinose markings at humeral areas; scutellum dark and with three pairs of strong bristles and several small setae;

postscutellum black. Legs with coxae and trochanters dark brown, other segments yellow to pale brown; in fore leg, femur yellow, but dark brown at base and knee joint, tibia yellow, but dark brown at base and brown at end, three basal tarsal segments yellow, but their distal ends brown, two distal segments pale brown; in middle leg, femur and tibia yellowish, but their bases and ends dark brown, tarsal segments as in fore leg; in hind leg, femur and tibia more brownish yellow than in other legs and basal and distal ends of femur and tibia more extensively dark than in other legs, tarsal coloration as in other legs. Fore femur with about eight thorn-like spines on flexor side, middle tibia with three apical spurs and two basal tarsal segments each with two distinct apical spurs, hind two basal tarsal segments each with two apical spurs. Claws symmetrical, each minutely bifid at tip. Leg segments from femur in proportion of 45:41.5:18:10.5:6.5:4:8 in fore leg, 54:47:28:14:8:3:8 in middle leg, and 66:65:40:15.5:8:4:8 in hind leg.

Wing pale brown, but brownish along costal margin, with veins brownish. Venation: fMCu beyond position of r-m, forking point between  $M_1$  and  $M_2$  at end of r-m, Rs fully 2.5 as long as  $R_1$  (27:10.5). Haltere pale brown.

Abdomen uniformly reddish brown or brown. Hypopygium rather small, brown; sternite 9 shallowly and evenly concave on caudal margin; coxite larger than style and somewhat conical; style small, slightly curved, round at tip, and each with small chitinated tubercle at extreme tip. Aedeagus with basal arms short and stout, basal margin very shallowly concave, caudal projection rather slender, parallel at side and ending in round tip; parameres very large, almost as long as coxite and style taken together, with basal arms large and subtriangular, caudal projection rather slender, slightly undulate, somewhat clavate, and round at tip.

*Female*: Body 2.8-3.0 mm. long. Wing 1.68-1.94 mm. by 0.59-0.66 mm. Coloration and structure mainly similar to those of male, except for usual sexual differences.

Head with eyes separated above as wide as one and one-half facets. Maxillary palpal segments in proportion of 8:12:19:11:13. Antenna with AR 1.55-1.7, seven distal flagellar segments in proportion of 16.5:17:36.5:38:37.6:44.5:43; segments 2 to 9 yellow on basal half and brown on distal half of each segment, segments 10 to 14 mainly brown, but basal swollen parts yellow.

Thorax with three pairs of strong and about ten small setae on scutellum. Color of legs somewhat paler or more yellowish than in male, but arrangement of dark-brown or brown markings similar to that of male; fore femur with nine or ten strong spines, middle tibia and three basal tarsal segments each with two distinct apical spurs, hind basitarsus with distinct apical spur. Claws symmetrical, each with small basal tooth. Proportion of segments: 49.5:43:14:8:5.3:4:9 in fore leg, 60:48:24:12:6:4:10 in middle leg, 73.5:66:39.8:15.3:7.8:5.4:11 in hind leg.

Wing fuscous along anterior area and on apical half; vein Rs longer than twice of  $R_1$  (39:17).

Abdomen with inner rods of tergite 7 reaching to middle of tergite 2; two spermathecae round, unequal, brown, with slender short neck part, one reduced spermatheca minute and tubular.

Holotype, male (US 64066); Mt. Dolen Nankep, Ponape, Aug. 13, 1946, Townes. Allotype, female (US), Colonia, Ponape, Aug. 8, 1946, Townes. Paratypes, eight females, same data as for allotype; female (BISHOP), same data as for holotype.

DISTRIBUTION: Caroline Is. (Ponape).

This species is named in relation to the yellowish color of the legs. *B. chrysocoma* Kieffer may be an allied species, but in *chrysocoma* the female AR is about 1.1, the thoracic scutellum has ten setae, and the fore femur is armed with only two spines on distal part, differing from this species.

145. *Bezzia pediaureola* Tokunaga and Murachi, n. sp.

Closely resembles *B. sulfureicruris*, having black thorax and yellow leg, but distinctly differs in the following points. Thorax entirely black, strongly shining, and without pruinose pattern on humeral areas in dry state; legs orange yellow and femora without brownish basal marking; wing vein Rs subequal to, or slightly shorter than, twice of  $R_1$ .

*Male*: Body length about 4.05 mm. Wing about 2.4 mm. by 0.5 mm.

Head entirely dark brown. Eyes separated above as wide as two to two and one-half facets. Maxillary palp with segments in proportion of 10:14:21:15:16. Antenna with scape dark brown; segments 2 to 10 yellowish brown and with same colored plumose hairs; segments 11 to 14 dark brown and their basal swollen parts yellowish; eight distal segments in proportion of 22.5:23.5:31.5:47.5:43.5:48:64.5:80; segments 2 to 8, 2 to 9, 2 to 10, 9 to 14, 10 to 14, and 11 to 14 about 43.5:53:73:78:70:49.

Thorax strongly shining black in dry state and dark brown in mounted specimen; scutum without pruinose pattern; scutellum probably with three pairs of strong bristles and many minute setae. Legs with coxae and trochanters brown, femora and tibiae orange yellow, but knee joints dark to pale brown; in fore leg, tibia with dark cloud at ventral side of distal tip, three basal tarsal segments yellow and two distal brown; in middle leg, tibia almost entirely orange yellow except for pale-brown extreme base, two basal tarsal segments yellow and three distal brown; hind leg similar to middle leg, but knee joint and distal end of tibia dark brown. Fore femur with nine or ten spines on flexor side, middle tibia with three distinct apical spurs and three basal tarsal segments each with two apical spurs, hind three basal tarsal segments each with two apical spurs; leg segments from femora in proportion of 60:48:22:14:8:5:10 in fore leg, 75:62:36:17:10:5:10 in middle leg, and 85:83:51:22:11:6:12 in hind leg.

Wing pale brown, with anterior veins yellowish brown. Venation: fMCu beyond r-m, Rs shorter than twice of  $R_1$  (44:24). Haltere white or yellowish.

Abdomen with tergites entirely dark brown and, in dry state, shining black. Hypopygium closely similar to that of *B. badiifemorata*; coxite somewhat conical and shorter than parameres; style as long as aedeagus, slightly curved before tip, and each ending in chitinized, spoon-like tubercle. Aedeagus with basal arms rather broad, widely divergent from each other, basal margin shallowly and evenly concave, caudal projection rather broad and slightly narrowed before round tip; parameres with slender basal arms, basal margin semicircular and caudal projection slender, longer than coxite, and ending in clavate round tip.

*Female*: Body about 4.6 mm. long. Wing 2.61 mm. by 0.72 mm.

Head dark and mouthparts dark brown; maxillary palp with segments in proportion of 11:15:25:14:17; eyes separated above as wide as two and one-half facets. Antenna with scape dark brown, following segments brown, but their basal parts yellowish; AR about 1.75; eight distal segments in proportion of 17:18.5:20.5:51:55:52:64:68.

Thorax black; scutellum with three pairs of strong bristles. Legs mainly orange yellow as in male; in middle and hind legs, tibiae each with one and three basal tarsal segments each with two strong apical spurs; proportion of leg segments about 58:50:17:11:6:5.5:10 in fore leg, 72:60:30.5:15:7.5:6:11 in middle leg, and 86:80:46:18:9:6.5:13 in hind leg.

Wing with anterior veins and costal and radial cells pale yellowish brown. Venation: fMCu under origin of r-m, Rs as long as twice of  $R_1$  (61:32). Abdomen entirely brown, inner rods of tergite 7 ending under tergite 3; two spermathecae round, brown, unequal, with short chitinized neck part, one spermatheca vestigial, minute, and tubular.

Holotype, male (US 64067), Nanpohnmal, Ponape, Jan. 29, 1953, Gressitt. Allotype, female (US), same data as for holotype. Paratypes, female (CM), Mt. Kupwuris, Ponape, north slope, 31-46 m., March 11, 1948, Dybas; two females (BISHOP), Agric. Exper. Sta., Colonia, Ponape, light trap, Jan. 6, 1953, Gressitt.

## DISTRIBUTION: Caroline Is. (Ponape).

This species somewhat resembles *B. kyotoensis* Tokunaga; however, in the allied species, the female AR is about 1.4, the femora of all legs have a dark preapical ring and the tibiae of all legs have a broad, dark median ring, the fore femur bears only two spines, and the female abdomen is provided with three pairs of short inner rods, differing from this species. This species is named in relation to the clear orange-yellow legs.

146. *Bezzia nigrialula* Tokunaga, n. sp. (fig. 98, a-g).

Medium size, black. Antenna of male with basal nine flagellar segments entirely yellow, including plumose hairs; that of female with several basal segments dark, but segments 6 to 12 paler or yellow and ultimate two segments somewhat brownish, AR about 1.69. Legs with femora dark brown, tibiae and tarsi mainly yellowish with brown bands or rings, fore femur thickened and with nine or ten dark spines arranged in line on entire length of ventral side. Wing with alula and basal part including arculus dark.

*Male*: Body about 2.85 (2.64-3.06) mm. long. Wing about 1.8 (1.71-1.92) mm. by 0.5 (0.48-0.52) mm.

Head entirely black, with eyes separated above as wide as 2 or 3 facets, proboscis rather short and about 0.45 as long as head capsule (15.5:34.8), clypeus highly setigerous and with 20 to 30 setae. Maxillary palp rather small, segment 3 with several scattered sensillae on apical half and without sensory pore, five segments in proportion of 9.5:15:18.9:13.5:15.6. Antenna with scape entirely black, following nine segments and their plumose hairs yellow, apical four segments mainly dark brown, but bases before verticils yellow; no terminal stylet; relative combined length of segments 2 to 9 and 10 to 14, 2 to 10 and 11 to 14, and 2 to 11 and 12 to 14 about 206.5:217.5:255:169 and 286:138, relative length of distal nine segments about 22:21.8:23.8:31.5:47.5:30:32.5:48.8:55.8.

Thorax entirely dark brown or brown; scutellum with four strong bristles and ten to 20 small setae. Legs with coxae dark brown or brown, trochanters slightly yellowish dark brown, femora mainly dark brown, but their bases slightly yellowish, fore femur with obscure yellowish or paler clouds on middle and preapical part, middle femur rarely with similar cloud on preapical part, tibiae mainly yellow, and with extreme bases and apical one-fifth or one-sixth dark, but fore tibia with very obscure, brownish cloud on middle part and middle tibia not clearly yellow, but brownish yellow and rarely with very obscure, brownish cloud on sub-basal part, basal two tarsal segments mainly yellow and with apical ends dark brown, following three segments entirely fuscous yellow; fore femur strongly thickened and with seven to nine ventral spines arranged in line throughout entire length, middle tibia with two apical spines and hind tibia with five or six bristles of comb and apical spine; claws bifid at tips. Leg segments, except for basal two, in proportion of 198.5:173:74.3:40.8:24.3:16.3:35 in fore, 243.5:209.8:125.5:58:31:18.3:31 in middle, and 279.5:274:164.3:70.3:34.3:19.8:36 in hind leg.

Wing with main veins fuscous brown, costal cell, radial cell, alula and base before and beyond arculus more or less fuscous, without macrotrichia. Venation: Costa ending at basal 0.74 of wing length (103.8:141.3) and slightly before level of tip of  $M_{3+4}$ ,  $R_s$  twice as long as  $R_1$  (41:20.5) and almost straight, relative length of  $R$ ,  $M$ , and stem of  $fMCu$  about 49.8:51.8:64.5,  $fMCu$  under midway of  $R_1$ ,  $M_{3+4}$  little longer than twice  $Cu_1$  (39.8:17.5). Haltere pale brown, pale brownish yellow or pale brownish white.

Abdomen entirely dark brown or brown. Hypopygium dark; sternite 9 without setae, about half as long as wide, with caudal emargination large and V-shape, caudal membrane quite bare; tergite 9 tapered and not far extended caudad beyond ends of coxites; coxites conical, rather short, about 1.3 times as long as basal width (29.5:22.8); style little shorter than coxites (25:29.5), slightly tapered, arcuate and with apices excavate; aedeagus with basal arch about one-fourth total length (8:32), both sides of basal arch dark, median lobe little longer than basal width (26:25), round apically, and with dark



ventral keel; paramere longer than aedeagus (41:34), ending at tip of aedeagus, with two pairs of basal roots: one pair subtriangular and one simple, median lobe more slender than that of aedeagus and only slightly wider than half of latter (4.5:8).

*Female*: Body length about 2.93 mm. Wing about 1.99 mm. by 0.72 mm. Coloration and structures generally as in male with usual sexual differences.

Head with eyes separated above as wide as 3 or 4 facets, proboscis about 0.45 times as long as height of head capsule (18:40), clypeus with about 20 small setae. Maxillary palp dark brown, slender, with five segments cylindrical and in proportion of 10:15:20:13:16. Antenna with scape dark, segment 2 with petiole yellow and apical half dark brown, segments 3 to 5 becoming gradually paler, segments 7 to 12 yellow, last two segments pale fuscous yellow; basal short flagellar segments oval and with long hyaline sensory hairs; AR about 1.69; distal eight segments in proportion of 12:14:16:36:36:34:39:38.

Thorax with scutellum with more minute setae than in male. Legs with coloration similar to that of male, but tibiae of fore and middle legs with more distinct, broad, dark markings on middle part. Hind tibial comb with five apical bristles; TR about 2.89; middle tibia with apical strong spine, basal three tarsal segments of middle leg each with two apical spines; in hind leg, tarsal segment 1 with apical and 2 to 3 each with two apical spines; claws of all legs symmetrical and each with small sub-basal tooth; leg segments, except basal two, in proportion of 189:173:60:30:22:20:31 in fore, 218:186:107:44:26:20:40 in middle, and 260:251:150:52:28:19:41 in hind leg.

Wing white, with costal and radial cell very pale brown, alula and basal part of wing including arculus dark, anterior veins very pale brown, but other veins obscure. Venation: Costa ending at basal 0.82 of wing length (126:153), relative length of R, M, and stem of fMCu about 49:53:58, Rs about 2.3 times as long as R<sub>1</sub>, M<sub>3+4</sub> about 1.8 times as long as Cu<sub>1</sub> (53:30), fMCu under r-m and its inner angle about 45 degrees. Haltere pale fuscous brown.

Abdomen with tergites dark brown, sternites reduced into membranes and very pale brown, pleural membranes fuscous; tergite 6 with pair of vestigial, minute gland rods, tergite 7 with pair of very long gland rods which extend cephalad into tergite 3; cerci dark brown; three spermathecae, dark brown, unequal, larger two spherical, with long chitinized part of duct, 7+14 by 14 units and 6+13 by 12 units and smallest one pyriform, without chitinized part of duct and 11 by 6.5 units.

Holotype, male (US 64622), Airai, Babelthuap, Palau, May 16, 1957, Sabrosky. Allotype, female (US), Ngaremlengui, Babelthuap, Palau, June 3, 1957, Sabrosky. Paratypes, Palau: Two males, same data as for holotype; male, Ngardmau, Babelthuap I., May 10, 1957, Sabrosky.

DISTRIBUTION: Caroline Is. (Palau).

This species is allied to *B. maculifemorata* Tokunaga and Murachi; however, in the allied species, the bases of wings including alulae are quite pale and never fuscous.

#### 147. *Bezzia nigrofasciata* Tokunaga, n. sp. (fig. 98, *h, i*).

Medium size, dark brown and dull white; legs mainly yellowish. Male antenna with basal nine flagellar segments and plumose hairs yellow and apical four segments brown; female antenna with flagellar segments yellow on basal parts before verticils and yellowish brown or brown on apical parts. Legs mainly yellow or yellowish white, fore femur with two obscure, brown clouds, other femora with apical parts widely dark, all tibiae with apical ends more or less dark; about ten fore femoral spines.

*Male*: Body length about 2.35 mm. Wing about 1.56 mm. by 0.4 mm.

Head entirely dark brown including mouthparts, with eyes separated above as wide as two facets, proboscis short, shorter than half of head capsule (12:30); clypeus with about 11 setae. Maxillary palp rather small, segment 3 with very few scattered sensillae

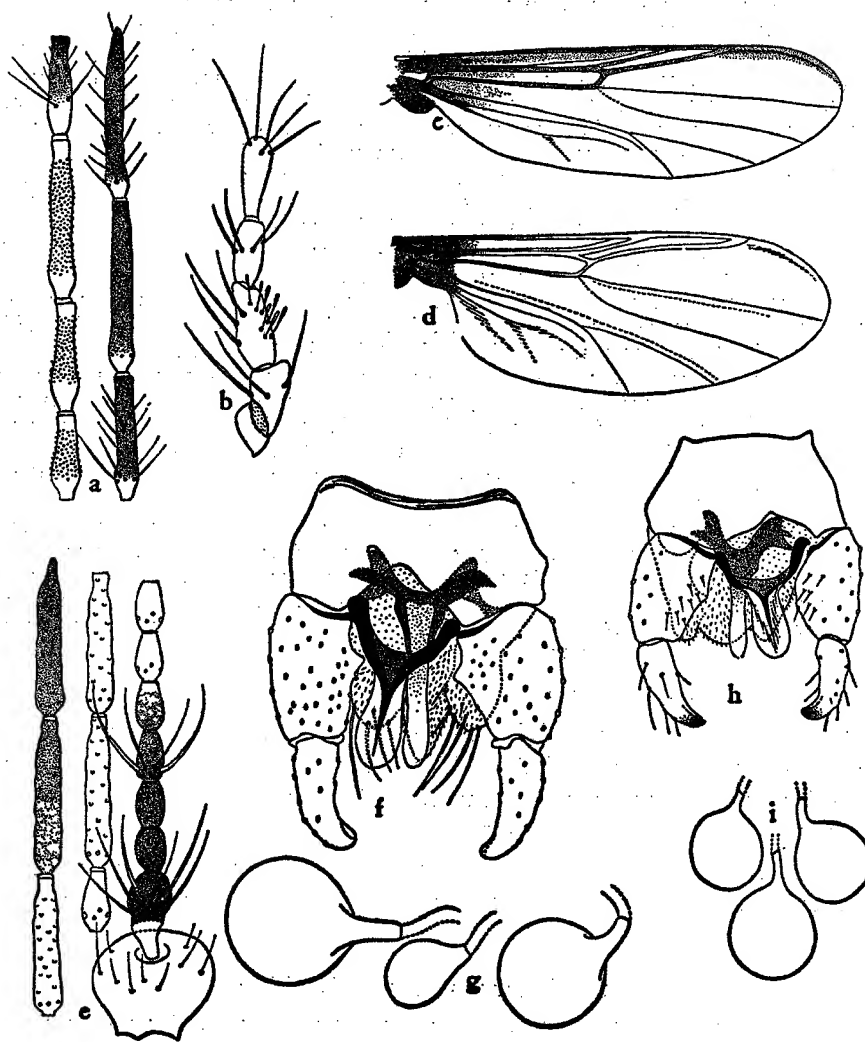


FIGURE 98.—a-g, *Bezzia nigrialula*: a, distal seven antennal segments, male; b, maxillary palp, male; c, wing, male; d, wing, female; e, antenna, female; f, hypopygium, male; g, spermathecae. h, i, *B. nigrofasciata*: h, hypopygium, male; i, spermathecae.

and without sensory pore, relative length of five segments about 7:10:18:10:13.5. Antenna with scapes brown, basal nine flagellar segments and their plumose hairs yellow, apical four segments brown, but their bases before verticils yellow; relative combined length of segments 2 to 9 and 10 to 14, 2 to 10 and 11 to 14 and 2 to 11 and 12 to 14 about 196:203:240:158 and 270:129; apical nine segments with relative length of 20:20:21:27:44:28:34:46:59.

Thorax mainly brown, scutum with a pair of narrow, obscure, median vittae between foveae on anterior half, caudoscuteal area very slightly yellowish, lateral part along lateral sides of foveae somewhat more brownish, lateral central parts obscurely brownish covering scutal sutures, scutellum slightly yellowish brown, with four strong bristles and several small setae. In dry specimen, scutum widely brownish and slightly pruinose, with a pair of zigzag white pruinose stripes on dark anterior half along lateral sides of foveae, middle part of anterior half between foveae slightly shiny, brownish and a dark mid-dorsal line. Scutellum with two pairs of strong bristles and several minute accessory setae. Legs mainly yellowish; in fore leg, femur yellow and with preapical and sub-basal brown clouds very much obscure, knee joint dark, tibia yellow with apical end dark, tarsal segments yellowish white and fourth obcordate segment pale brown; in middle leg, femur yellow and with apical quarter dark, tibia yellowish white and both extreme ends dark, tarsi as in fore leg; in hind leg, coloration mainly as in middle, but femur dark on apical one-third, tibia more widely dark at tip and not dark at base. Fore femur with about ten ventral, dark spines arranged in a line on entire length, middle tibia with apical spine, basal two tarsal segments each with two apical spines, hind tibia with six bristles of apical comb, tarsal segment 1 with two apical spines and 2 to 3 each with an apical spine; claws small, equal and slightly bifid at tips. Relative length of leg segments, except for basal two, about 175:140:70:35:20:15:30 in fore, 215:182:172:48:26:15:28 in middle, and 255:240:153:62:30:18:35 in hind leg.

Wing almost colorless and hyaline including veins, no macrotrichia. Venation: Costa ending at basal 0.74 of wing length (91:123),  $R_s$  about twice as long as  $R_1$  (40:20) and ending just before tip of  $M_{3+4}$ , relative length of  $R$ ,  $M$ , and  $fMCu$  about 45:47:57,  $fMCu$  under midway of  $R_1$ ,  $M_1$ , and  $M_2$  forking at end of  $r-m$ ,  $Cu_1$  ending at level of tip of  $R_1$ ,  $M_{3+4}$  about twice as long as  $Cu_1$  (32:15). Haltere entirely white.

Abdomen dull yellowish white, with sclerites atrophied. Hypopygium brown; sternite 9 without setae, with caudal emargination shallow, about two-fifths of total length and V-shape, caudal membrane quite bare; tergite 9 trapezoid and ending at level of apices of coxites; coxites conical, as long as sternite 9, little shorter than aedeagus (25:27) and about 1.5 times as long as basal width (25:16); styles slightly curved, with shallow depression at tip of each mesal side and much shorter than coxites (21:25); aedeagus with basal arch about one-third as long as total length, wide and semicircular, median lobe flattened, round at tip, and extending very slightly beyond tips of coxites; parameres much longer than aedeagus (34.5:27), with basal arch as high as that of aedeagus, basal roots with three angles, median lobe rather slender, about half as wide as that of aedeagus (4.5:8) and round at tip.

*Female*: Body about 2.54 mm. long. Wing about 1.7 mm. by 0.55 mm. Coloration generally as in male.

Head with eyes separated above as wide as 1.5 facets, proboscis short and about 0.4 as long as head capsule (13:34), clypeus with about 14 setae. Maxillary palp slender, with scattered sensillae, five segments in proportion of 7:12:19:12:14. Antenna with many yellow and brown parts alternately arranged, scape yellowish brown, short basal segments yellow on basal half and yellowish brown on apical half, apical five segments mainly brown, but bases before verticils yellow; no terminal stylet, AR 1.82 to 1.84; distal eight segments about 13.3:15:17.8:48:43:39:46.3:56.5.

Thorax as in male; scutellum with many small setae beside four strong bristles. Legs with color as in male, but fore femur without sub-basal and preapical brown clouds, all tibiae dark at extreme bases, nine fore femoral spines, claws symmetrical and each unequally bifid into large lateral and small sub-basal one; tarsal apical spines: in middle leg, basal three segments each with two apical spines; in hind leg, segment 1 with apical;

hind tibia with six bristles in apical comb; leg segments, except for basal two, 175:142:64:30:17:15:30 in fore, 221:173:107:42:20:16:31 in middle, and 250:235:155:60:25:18:39 in hind leg.

Wing venation: Costa ending at basal 0.8 of wing length (109:137), Rs about 2.6 times as long as  $R_1$  (54:21), relative length of R, M, and stem of fMCu about 45:46:55, fMCu under basal one-third of  $R_1$ , base of  $M_2$  atrophied,  $M_{2+4}$  about 1.8 times as long as  $Cu_1$  (42:23) and ending slightly before costal end,  $Cu_1$  ending under tip of  $R_1$ .

Abdomen mainly dull yellowish white, but caudal end including cerci brownish, with inner rods of tergite 7 brownish yellow, long, and reaching to middle part of tergite 2; three spermathecae brown, round, each with rather long neck part, about 6.5+13.5 by 13.5 units, 3+12 by 12 units, and 5+12 by 11.5 units.

Holotype, male (US 64623), Kolonia, Yap I., Yap Is., at light, June 21, 1957, Sabrosky. Allotype, female (US), with holotype. Paratype, male, with types.

DISTRIBUTION: Caroline Is. (Yap).

This is closely allied to *B. sulfureicruris*, but in the allied species the coloration of the legs is more clearly yellow, the femoral brownish apical parts are much narrower, the abdominal tergites are uniformly brown, and there are two spermathecae, differing from the present species.

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